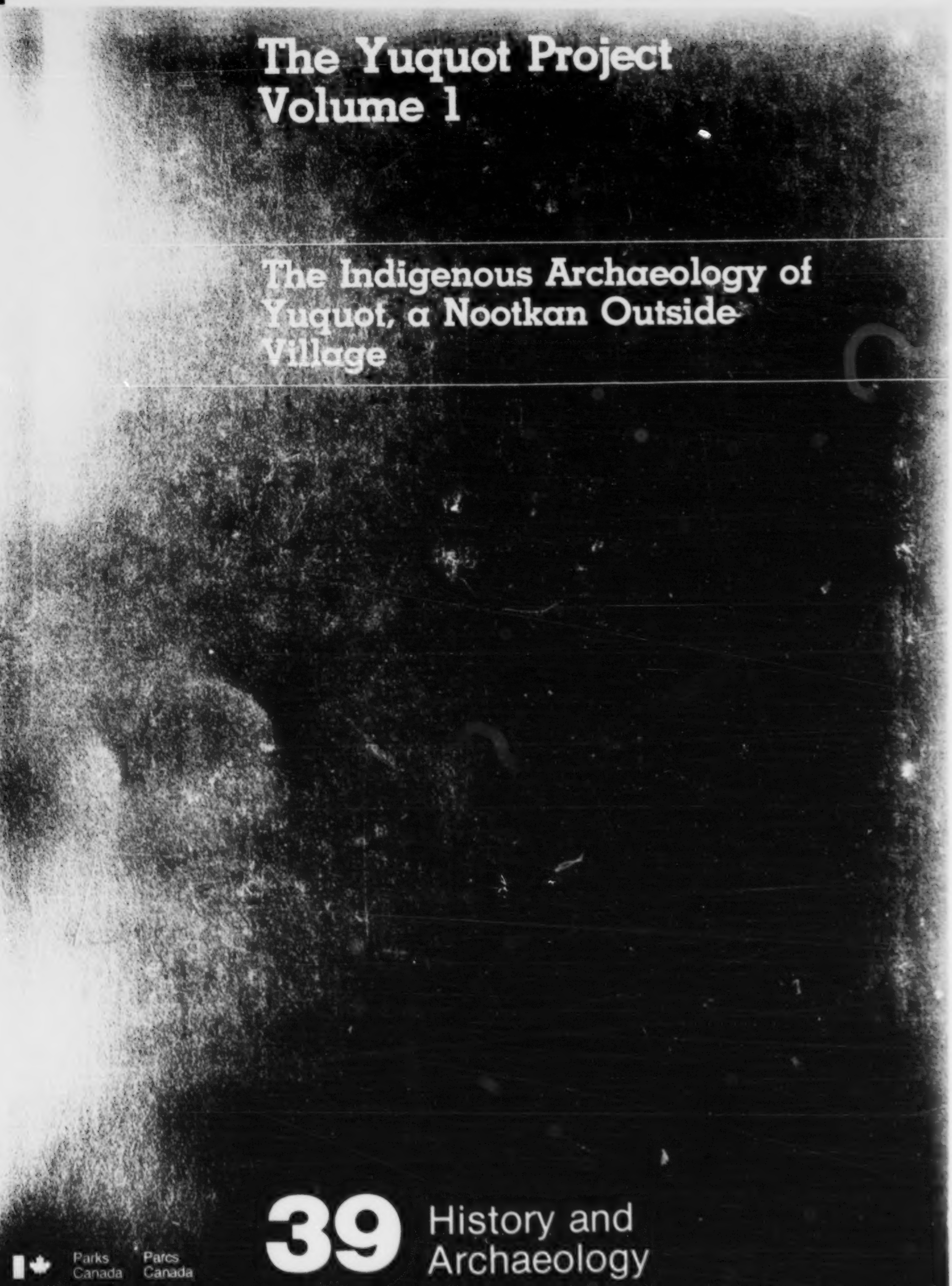

The Yuquot Project
Volume 1

The Indigenous Archaeology of Yuquot, a Nootkan Outside Village

39 History and Archaeology

Parks Canada Parcs Canada

History and Archaeology
39

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Volume 1

William J. Folan and John Dewhirst,
Project Editors

The Indigenous Archaeology of Yuquot, a Nootkan Outside Village

John Dewhirst

National Historic Parks and Sites Branch
Parks Canada
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Preface

This paper introduces a series of complementary studies undertaken since 1966 on the history and archaeology of Nootka Sound, British Columbia. Research has focussed on the Mowachaht Nootkan village of Yuquot, also known as Friendly Cove and Nootka. This multidisciplinary research, some of which has been reported earlier in preliminary and tentative form (Aish et al. 1968; Folan and Dewhirst 1970; Rick 1970; Brathwaite and Folan 1972; Folan 1969, 1972a,b, 1974; Savage 1973; Clarke and Clarke 1974; Dewhirst 1969, 1977, 1978, 1979), has come to be known as the "Yuquot Project." At the time of this writing, many Yuquot studies have been completed or are nearing completion and will soon appear in this publication series. Most contributions are relatively specialized and may be better understood from the background presented here.

The Yuquot research was conducted in response to objectives initiated by the Historic Sites and Monuments Board of Canada, which has long recognized the historical significance of Nootka (Yuquot). At the Board's recommendation a plaque was erected at Friendly Cove in 1924 to commemorate the visit of Captain Cook to Nootka Sound in 1778, the establishment of a Spanish military post at Nootka (1789-1795) and the historic meeting there of Quadra and Vancouver in 1792 to carry out the terms of the Nootka Convention. The Board recommended in 1964 that the National Historic Parks and Sites Branch conduct archaeological investigations at Yuquot.

Excavations directed by William J. Folan and assisted by J.T. Dewhirst took place in the summer of 1966. The Spanish gun battery of San Miguel at the entrance to Friendly Cove was thoroughly investigated, but modern houses and cemetaries at Yuquot prevented excavation of the probable sites of former Spanish buildings and John Meares' trading post constructed in 1788. The Nootka (now Mowachaht) Band allowed us to explore an abandoned area near the middle of the village, in the approximate location of the Spanish troop quarters. A large trench opened here revealed deep stratification and yielded an enormous sample of native and European artifacts and faunal remains. In addition, a limited survey was made of native village sites in Nootka Sound, particularly those visited or mentioned by Europeans in the late 18th century.

In 1967 the Board recommended that a National Historic Park be established at Nootka Sound and requested a study of the feasibility of such a park. It would commemorate first contact between Indians and whites, and the Indian way of life in British Columbia. Any development would take into account the findings of the archaeological and historical research underway.

The principal objective of the Yuquot research has been to develop a comprehensive picture through time of native culture and the interrelationships of native and non-Indian cultures at Nootka Sound. How far back in time does the ethnographically known pattern of Nootkan culture extend, and what are the antecedents of the ethnographical pattern? How had intensive contact with Europeans, first in the late 18th century and later after the mid-19th century, affected native culture at Nootka Sound? We have attempted to achieve these broad objectives by means of a conjunctive approach involving archaeology, ethnohistory, ethnology, ethnography and history. Each specialized study within these disciplines has in turn its own objectives which are discussed in the respective reports.

By 1968 the increasing multidisciplinary scope of the research - requiring specialists in ichthyology, malacology, ornithology, mammology, geology, physical anthropology and historical archaeology - had developed into the "Yuquot Project," with Folan and Dewhirst as senior and junior investigators, respectively. The expanded scope of the Yuquot research could not be completely accommodated within Parks Canada. The ethnohistorical and indigenous archaeological research was supported by the Canada Council. Parks Canada continued to support analyses of historical artifacts and most faunal remains and provided technical and publication services.

The Yuquot Project has been made possible only through the cooperation and support of many persons and agencies. Space permits mentioning only the primary ones here.

The Mowachaht Band graciously allowed us to live at Yuquot and to inquire into their cultural past. Virtually everyone showed us hospitality, cooperation and enthusiasm. Mr. and Mrs. Robert Marchand, Indian Affairs Branch school teachers, and Reverend William Elliott, O.M.I., were instrumental in getting the 1966 field operation on its feet. The excavation itself and general success of the field project would not have been possible were it not for the understanding and support of the late Edward Jack, then Chief Councillor of the Nootka Band. We are also indebted to the many persons who patiently answered our endless questions on past and present Nootkan culture, in particular: Mr. and Mrs. Harry Dick, Mr. and Mrs. Johnny Williams, Mr. Edward Jack, Mr. and Mrs. Ambrose Howard, Mr. and Mrs. Benedict Andrews, Mrs. Elizabeth ("Queen") George and Mrs. Annie Jumbo. The success of the 1969 ethnographic research trip owes much to former Chief Councillor and Mrs. Jerry Jack. We hope that our research papers have accurately captured what these people have tried to impart to us and that they contribute to Mowachaht history and identity.

The Canada Council generously supported the ethnohistory research and analysis of indigenous archaeology during 1969 and 1970 (grants 68-1550, S68-1550-S1, S70-0557, S70-0557-S1). The Department of Sociology/Anthropology, St. Patrick's College, Carleton University, through the cooperation of Dr. Gordon Irving, provided office and research facilities in conjunction with the Canada Council support.

Completion of most Yuquot contributions and their appearance in this series have been possible through the generous support of the National Historic Parks and Sites Branch, Parks Canada. On numerous occasions this support surpassed dollars and cents to contribute professional guidance, personal understanding and great patience. In these respects we wish to recognize Mr. John H. Rick, Chief, Research

Division; Mr. Jervis D. Swannack, former Assistant Chief (Archaeology); and Ms. DiAnn Herst, Chief Archaeologist.

We especially remember two colleagues who have died since the beginning of the project. Former Chief Councillor Edward Jack selected the major excavation site and in many ways ensured the success of the field archaeology. His efforts have indirectly affected the subsequent course of the research. Louise R. Clarke made a contribution felt far beyond the Yuquot mollusc research. Her dedication and enthusiasm inspired other researchers to persevere in analysing the immense archaeological sample. Her meticulous notes on the Yuquot mollusc remains enabled more precise definitions of stratification and differentiation of cultural periods.

We dedicate the Yuquot volumes and contributions to Edward Jack and Louise R. Clarke.

William J. Folan, Senior Investigator
Center for Archaeological Research
Division of Social Sciences
University of Texas at San Antonio
San Antonio, Texas 78285, USA
and
John Dewhirst, Junior Investigator
National Historic Parks and Sites Branch
Parks Canada, Cornwall, Ontario K6H 5V4

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This research study, begun in 1966, has been realized through the support and assistance of several institutions and many persons.

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Of the many persons connected with the project, I am most indebted to Dr. William J. Folan, field director of the excavations at Yuquot, and senior investigator of the Yuquot Project. His vision, guidance and generosity contributed immeasurably to the Yuquot field projects and inspired many of the results reported here.

The success of the archaeological excavations and related fieldwork at Yuquot was possible only through the support, interest and hospitality of the Nootka (now Mowachaht) Band and its members. In these respects, former chief councillors Edward Jack and Jerome Jack must be recognized.

Warm thanks are extended to other members of the field crew whose work has provided the raw data for this report:

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In 1967, 1969 and 1973 studies made of Nootkan material culture and ethnohistoric materials contributed greatly to my understanding of Nootkan culture and the analysis of the indigenous artifacts. The following institutions made their collections available for study: American Museum of Natural History; British Columbia Provincial

Archives; British Columbia Provincial Museum; Campbell River and District Historical Society; Laboratory of Archaeology, University of British Columbia; Milwaukee Public Museum; Museum of the American Indian; Museum of Anthropology, University of British Columbia; Museum of Archaeology and Ethnology, Simon Fraser University; National Museum of Man; Ozette Archaeological Project, Washington State University; Peabody Museum, Harvard University; Peabody Museum of Salem, Salem, Mass.; Public Archives of Canada; Smithsonian Institution; Vancouver Centennial Museum; Vancouver City Archives; Washington State Archives. Although space permits only a collective thanks to the staffs of the above institutions, several persons must be mentioned for their many kindnesses: Mr. Peter Macnair and Mr. Donald Abbott of the British Columbia Provincial Museum, Dr. Stanley Freed and Mr. Phillip Gifford of the American Museum of Natural History, Mr. Vincent Wilcox of the Museum of the American Indian and Dr. Richard Daugherty and Mr. and Mrs. Gerald Grosso of the Ozette Archaeological Project. Mr. J.C.H. King kindly sent me data on Nootkan artifacts in the Museum of Mankind, London, England.

In 1969 an attempt was made at ethnoarchaeology. Several persons kindly provided information on the excavated indigenous artifacts and photographs of Nootkan material culture: Mr. and Mrs. Benedict Andrews, Mr. and Mrs. Harry Dick, Mrs. Elizabeth ("Queen") George, Mr. Ambrose Howard, Mrs. Annie Jumbo, Mrs. Frank Savey and Mr. Alex Thomas. The above fieldwork would have been impossible had it not been for the generous hospitality and thoughtfulness of four families: Mr. and Mrs. Jerome Jack of Gold River, Mr. and Mrs. Alban Michael of Nuchatlitz, Mr. and Mrs. George August of Yuquot, and Mr. and Mrs. Benedict Andrews of Nootka.

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I am also grateful for advice, suggestions and comments on various aspects of the research. Drs. Jan Muller and John Clague, Geological Survey of Canada, kindly answered my questions on former sea levels on the West Coast, and commented on an earlier draft of the section on postglacial events. Dr. Weston Blake, Geological Survey of Canada, responded to my queries on our radiocarbon date results and arranged for an additional test of a key sample. Dr. S. Kumar, Department of Indian and Northern Affairs, advised on the statistical comparison of radiocarbon dates. Dr. Robson Bonnichsen, University of Maine, kindly answered my questions on bipolar flaking. Dr. Don McAllister and Mr. Charles Gruchy, National Museum of Natural Sciences, replied to queries regarding dogfish and other fishes at Nootka Sound. Mr. Brian Finch, Revenue Canada, suggested the possibilities of the energy dispersive X-ray fluorescence spectrometer for identifying the fibre stains on artifacts. This report has benefited considerably from comments by William J. Folan, Richard Lueger and Jervis D. Swannack.

I am indebted to my colleages in Parks Canada for their support and assistance in producing this report. Ms. Bronwen Jones assisted the artifact analysis during the summer of 1974. Mr. Albert Wilson surveyed the site and produced the site maps. Mr. Steve Epps prepared the excavation profile drawings and charts. The shaded drawings of artifacts are the work of Mr. Ira Upin, on contract to Parks Canada. The black line drawings of artifacts were done by Ms. Dorothy Kappler and Ms. Karen Gillies. Photographs of artifacts, unless noted otherwise, are all by Mr. George Vandervlugt. Site and field photographs, unless noted otherwise, are by the author. Mr. James Henderson provided technical advice on the input of artifact measurements into the computer, and the significance of distributions. The drudgery of final preparation of this report was considerably alleviated by Ms. Dolores Cattroll who typed tables and text and checked artifact illustrations. Ms. Jean Aish Brathwaite, senior editor of the publications unit, provided editorial counselling. Mrs. Sylvia Bowerman entered the manuscript on the AES word processor. Finally, a special thanks is owed to Ms. DiAnn Herst, Chief Archaeologist, Archaeological Research Section, whose patience and positiveness contributed significantly to the completion of this report.

Any errors, omissions and misinterpretations that may be found in this report are solely my responsibility.

The Indigenous Archaeology of Yuquot, a Nootkan Outside Village

John Dewhirst

iii Preface
vi Acknowledgements
5 Abstract
7 Introduction
9   Archaeological Research Objectives
9   Geographical Setting
11   The Moachat Annual Round
15   Archaeological Manifestations of the Subsistence Cycle
19 The Site
19   Yuquot in 1966
22   The Midden
25   Excavations
33   The Sample
34   Provenience Numbering System
36 Stratigraphic Contexts, Radiocarbon Dating and Features
39   Late Pleistocene and Post-Glacial Events
42   Zone I
44   Zone II
51   Zone III
54   Zone IV
60 Artifact Analysis
61   Method of Study
65 Manufacturing Technology and Basic Tools
66   Abraders
94   Celts
125   Wedges
133   Beaver Incisor Tools
133   Antler Sleeve Haft
135   Cobble Plane
136   Hammer Tools
138   Perforators
155   Needles and Shuttles
163   Tools for Working Cedar Bark
165   Bevelled Bone Rectangles
168   Knives
170 Fishing with Hooks and Lines
170   Arming Points of Composite Fish-Hooks
195   Shanks of Composite Fish-Hooks
210   Gorges

222 Possible Fishing Sinkers
226 Fishing with Harpoons, Leisters and Other Devices
226 Harpoon Foreshafts
230 Toggling Harpoon Heads for Salmon
265 Leisters
271 Toggles
272 Utilitarian Club
272 Possible Herring Rake Tine
273 Miscellaneous Points
279 Hunting with Arrows
280 Thin Wide Points
282 Points with Many Closely Spaced Unilateral Barbs
284 Points with Few Widely Spaced Barbs
287 Other Unilaterally Barbed Points
290 Hunting with Harpoons
290 Bilaterally Barbed Harpoon Heads
291 Unilaterally Barbed Heads with Shouldered Tang
294 Large Unilaterally Multibarbed Heads with Line Holes
294 Other Male Harpoon Heads
298 Simple Valves of Composite Whaling Harpoon Heads
300 Slotted Valves of Composite Toggle Heads
305 Unilaterally Barbed Arming Point
306 Possible Slate Arming Blade
306 Possible Uncompleted Finger Grip
307 Personal Adornment and Ceremonialism
307 Perforated Northern Fur Seal Teeth
309 Tooth Jinglers
309 Perforated Hair Seal Canines
312 Worked Sea Lion Postcanines
313 Worked Sea Otter Tooth
313 Perforated Bear Teeth
313 Worked *Canis* Teeth
313 Worked Coast Deer Tooth
313 Whole Tooth Artifacts of Unidentified Mammals
314 Split Teeth of Sea Mammals
316 Perforated Otariidae Phalanges
318 Perforated Coast Deer Phalanges
319 Perforated Bald Eagle Phalanx
319 Perforated Astragali
321 Shaped Bone Pendants
322 Shell Pendants
322 Stone Pendants
322 Possible Labret Fragment
324 Possible Paint Materials
325 Land Mammal Bone Beads
326 Bird Bone Beads
326 Broken Tips of Drinking Tubes or Uncompleted Beads
327 Spruce Gum Beads
327 Tubular Stone Bead
327 War Clubs
330 Whalebone Rings
331 Whistles

333 Figures
336 Cultural Continuity and Change
337 The Early Period (pre-2300-1000 B.C.)
338 The Middle Period (1000 B.C.-A.D. 800)
342 The Late Period (A.D. 800-1790)
345 The Historic Period (A.D. 1790-1966)
348 References Cited

Abstract

This report describes geographical and archaeological contexts at Yuquot, British Columbia, and presents an analysis of indigenous artifacts recovered there. Yuquot, at Nootka Sound on the west coast of Vancouver Island, was the major outside village occupied by the Moachat Nootka, who practiced a two-part annual subsistence cycle scheduled to exploit fluctuating seasonal resources in outside and inside geographical settings. Archaeological excavations undertaken by Parks Canada in 1966 uncovered four stratigraphic zones. They suggest continual human occupation of the site from at least as early as 2300 B.C. to the present. The indigenous artifacts recovered are classified according to shape and use. The latter is inferred by means of the direct historical approach, wear patterns on artifacts and ethnoarchaeology. Most artifact classes are identified as parts of composite devices used for fishing nearshore species, primarily salmon and rockfish. The artifact classes reflect a single conservative culture that changed gradually through time. A continuum model of four periods, each based on a dated stratigraphic zone, traces cultural continuity and change at Yuquot from 2000 B.C. until the late 19th century A.D., when indigenous culture began to change substantially from Euro-Canadian influences.

Submitted for publication 1979, by John Dewhirst, National Historic Parks and Sites Branch, Parks Canada, Cornwall.

Introduction

This paper contains two interrelated parts: the site report of the Yuquot excavations in 1966, and an analysis of the indigenous artifacts recovered. The site report describes the contexts for all the analyses of Yuquot artifacts and faunal remains. The indigenous artifact analysis herein is but one aspect of the Yuquot culture history. A more complete picture is formed when studies of the other artifacts, faunal remains and history are comprehended together. These other contributions elaborate and complement the indigenous artifact analysis. Such contributions also realize many general and specific research goals of the Yuquot archaeology.

The research goals of large archaeological projects that continue for more than a decade are affected by developments in archaeology of the project culture area, and improvements in archaeological methods. Original goals and field data must be appreciated according to the state of the art at the time.

In 1966 the Northwest Coast was one of the last archaeological frontiers in North America. Most excavations in British Columbia had taken place in the Gulf of Georgia region and in the Fraser Canyon (for summaries see Carlson 1970; Mitchell 1971: 29-44). A survey had been conducted of the northern Northwest Coast (Drucker 1943). Researchers in Northwest Coast prehistory, compensating for absent archaeological data, extended the time perspective of ethnographical cultures by means of the direct historical approach, diffusionism and glottochronology. Research focussed on the sources and development of Northwest Coast cultures.

The Nootka long held special significance for theories of the sources and development of Northwest Coast culture. The geographical position of the Nootka on the west coast of Vancouver Island is thought to have isolated them fron mainland cultural influences. Early cultural patterns would consequently best survive in this relative geographical and cultural isolation. The Nootka and Southern Kwakiutl were found to have no specifically interior plateau culture traits and were deemed to represent the oldest, most typical or "purest" strain of Northwest Coast culture (Drucker 1943, 1955; Borden 1951). Because the Nootkan geographical setting is maritime - an open, rugged coastline broken by inlets - the earlier forms of Nootkan (and Northwest Coast) culture must necessarily be maritime.

The most maritime and most fascinating aspect of Nootkan culture was the whaling complex (Curtis 1916; Waterman 1920; Drucker 1951). This complex, not indigenous to other Northwest Coast cultures, was assumed to be a survival of earlier cultural patterns and affinities. Culture trait comparisons of Nootkan whaling with whaling among the highly maritime Eskimo-Aleut (Lantis 1938, 1940; Collins 1940; Heizer 1943: 447-8; Borden 1951, 1962; Drucker 1955; Swanson 1956;

Huntsman 1963; Duff 1965) were believed to indicate an ancient cultural relationship: either culture contact between the Nootka and Eskimo-Aleut (Borden 1951, 1962: 18; Drucker 1955: 74, 76; Duff 1965) or derivation of Wakashan culture from an "early maritime sea-hunting and fishing form of Eskimo-Aleut culture" (Drucker 1955: 64) or "proto-Eskimo base" (Duff 1965: 30). Such an antecedent, considered basic to maritime cultures along the North Pacific Rim, is hypothesized to have dispersed from southwestern Alaska (Chard 1956, 1962).

Such was Nootkan prehistory before 1966. Since these theories were put forward some years ago, the methodological shortcomings of diffusionism and culture trait comparisons have become widely apparent. More significant, however, is that the application of improved research methods and expansion of archaeological investigations into unknown coastal regions profoundly changed the above perspective. The new excavations revealed complex site-environment relationships, unanticipated great time depth, remarkable cultural continuity, homogeneous assemblages and no eskimoid remains.

In the Nootka culture area, a long-term, still on-going archaeological project began in 1966 at the Makah village of Ozette (Daugherty 1970-77; McKenzie 1974). In 1968 excavations were conducted at Coopte (kūptī) in conjunction with a site survey of Nootka Sound (McMillan 1969). In 1971 the first of a series of field seasons on Hesquiat sites began with formation of the Hesquiat Project (Haggarty and Boehm 1974). In 1973 excavations were conducted at the head of Alberni Inlet (McMillan and St. Claire 1975). In 1975 site surveys were made of the Alberni Valley and upper Alberni Inlet (McMillan 1975), and Barkley Sound (St. Claire 1976).

Results of most of this work have appeared so far as preliminary reports. The Ozette research has produced several papers, mostly theses on specialized topics (reported in Daugherty 1970-77). Several preliminary papers on Yuquot have appeared (Folan 1969, 1972a, b; Folan and Dewhirst 1970; Dewhirst 1969, 1977, 1978, 1979; Clarke and Clarke 1974a). In addition, a culture history exhibition by Parks Canada, "Yuquot: 4000 Years of Continuity and Change in a West Coast Village," was displayed at the Museum of Anthropology, University of British Columbia, from April 1978 to February 1979, and at the McCord Museum, McGill University, during April and May 1979. Definitive, integrative reports on the Ozette, Hesquiat and Alberni research are in advanced preparation at the time of this writing and should soon appear in print.

Field archaeology in the Nootka culture area was initially seen from the perspective of the "pre-archaeological" theories. The research goals of the Yuquot archaeology were first oriented to testing the theories. But Nootka research has now outstripped them in most respects, yet is ironically not able to provide data on origins. The above cited theorists would no doubt wish to revise their ideas. It should be remembered, however, that many concepts expressed in their hypotheses still influence research on the Northwest Coast and reflect fundamental problems. Some of these have been rephrased or readapted in the Yuquot research objectives.

Archaeological Research Objectives

The Yuquot archaeology is directed toward several broad areas of inquiry that can be expressed as general research problems. They pose questions that cannot be fully answered by any single Yuquot archaeological study. The reader, therefore, should see each study, such as the indigenous artifact analysis, as an aspect of larger patterns of research findings. Each study deals with issues and problems pertaining to its particular scope of research. When all archaeological studies are completed, a synthesis of their results will be prepared.

Like the pre-archaeological theorists, we were curious about the origins and development of Nootkan culture. How long has the ethnographical pattern persisted? Was the whaling complex a survival of an earlier, more maritime-oriented culture? The theorists had defined Nootkan maritimeness in terms of specific culture traits, which leaves one wondering about holistic cultural patterns and their physical manifestations. The latter, in particular faunal remains and artifacts, would enable a definition of Nootkan culture in terms of subsistence, technology and ecology. Such constructed patterns of Nootkan culture, expressed in a holistic model through time, are a major research concern of the Yuquot archaeology. It is important to see how this pattern changed from within native culture, and from intensive contact with Europeans late in the 18th century, and again after the mid-19th century.

The excavation strategy employed at Yuquot was designed to ensure a well controlled, comprehensive collection of all artifacts and faunal remains and to record their archaeological contexts, so that a multidisciplinary, conjunctive approach could be used in analysis. A control system combining both arbitrary levels and stratigraphic units contained within the levels was devised for this purpose (Folan and Dewhirst 1966).

Yuquot, with the longest continuous sequence of Nootkan outside sites so far investigated, is significant as a type site not only for the native cultural record, but also for remains of the first European settlement in British Columbia. Is it therefore important that the site report and analyses of cultural remains include basic data from which the inferences, calculations and conclusions are derived, so that these can be better understood and, if necessary, reassessed. This has been attempted as a general research objective. Before turning to the site report and analysis of indigenous archaeology, it will be helpful to define the geographical contexts of Nootka Sound, and the ethnographical pattern of Nootkan cultural ecology.

Geographical Setting

The west coast of Vancouver Island inhabited by the Nootkan peoples consists of an open, unprotected outer coast broken by a series of sounds on which groups of long, narrow inlets coverge. This coastline contains two major geographical settings: an outer coast/fjord mouth environment, and an inner fjord/river mouth environment. The Nootkans refer to these settings respectively as kla'a or "outside" in English, and hilstīs or "inside" (Smithsonian Miscellaneous Collections 1916).

The "outside" is characterized by a rocky, outer coast, relatively unbroken and completely exposed to the open Pacific. Offshore are banks, reefs and rocks belonging to a narrow undersea shelf. The 20-fathom line extends offshore to about three miles; the 50-fathom line, from 4 to 12 miles. This shelf supports considerable tidal, pelagic and demersal food resources. A riparian lowland less than 500 ft. above sea level extends inland for up to about three miles along the outer coast and mouths of inlets. (Notable exceptions are the Hesquiat Peninsula and Long Beach, where the lowland widens to nearly seven miles.) The lowland contains an occasional lake near the shore and generally few streams of consequence. The open, rugged outside offers a limited number of sheltered sites suitable for long-term habitation and effective year-round exploitation of the rich marine resources. Sheltering offshore islands lie mainly within the sounds and mouths of inlets.

The "inside" is the inlets which may penetrate inland from a few miles to as much as 40 miles in the Alberni Inlet. Most inlets are from a few hundred yards to nearly two miles across. Nearby hills and mountains rise from 2000 to 4000 ft. above the sea; relief increases with the distance inland. Major rivers at the heads of inlets and lesser streams along the sides break the generally steep rocky shores. Apart from fluvial deposits at stream mouths, the shores plunge for many fathoms. Some streams are fed by nearby lakes. Major rivers at heads of inlets often connect to large inland drainage systems. Some of these served as overland trails which linked northern Nootkan groups to the Nimpkish Kwakiutl, and the Nitinat to the Cowichan Salish. The inlets lack the rich, offshore marine resources of the "outside," but compensate with other rich fluctuating resources. Many inside streams, particularly all the large ones, support good-sized runs of most species of salmon. Land mammals and edible plants are plentiful on the inside. Although the inside is fairly sheltered and less rugged than the outside, the number of salmon streams and suitable long-term habitation sites is also limited.

Both the "outside" and "inside" settings are characterized by the coastal western hemlock biogeoclimatic zone (Krajina 1959: 4-8; 1965; 1969: 35-41). It has a humid, rainy climate with an annual precipitation of 165 to 665 cm; precipitation increases with windward nearness to the Vancouver Island Mountains. Winters are mild (January mean monthly, -4° to 5°C) and wet (wettest month precipitation 28 to 117 cm), accounting for from 30 to 40 per cent of annual total precipitation. Summers are cool (July mean monthly, 13° to 18°C) and comparatively dry (driest month precipitation, 3 to 16.5 cm), receiving 7 to 15 per cent of annual total precipitation. The annual range of temperature is narrow; the mean monthly ranges from 9° to 21°C. There are 120 to 250 frost-free days per annum. The coastal western hemlock biogeoclimatic zone contains two subzones resulting primarily from differing amounts of precipitation.

The wet subzone, typical of most of the Nootkan region, has a total annual precipitation of 280 to 665 cm. It supports a predominantly coniferous rainforest characterized by Douglas fir (Pseudotsuga menziesii), western hemlock (Tsuga heterophylla), western red cedar (Thuja plicata), Pacific silver fir (Abies amabilis), Sitka spruce

(*Picea sitchensis*), lodgepole pine (*Pinus contorta*), western white pine (*P. monticola*) and yellow cypress (*Chamaecyparis nootkatensis*). Significant deciduous trees frequently found in the dry subzone occur infrequently in the wet subzone.

The dry subzone has an annual total precipitation of 165 to 280 cm. All the above conifers, except for the Pacific silver fir and yellow cypress, grow there. The grand fir (*Abies grandis*), not found in the wet subzone, is common. Although the conifers dominate, several deciduous trees are frequent: western alder (*Alnus rubra*), balsam poplar (*Populus balsamifera*), black cottonwood (*P. trichocarpa*), bigleaf maple (*Acer macrophyllum*), vine maple (*A. circinatum*) and bitter cherry (*Prunus emarginata*). Arbutus (*Arbutus menziesii*) grows on only the driest sites. The dry subzone is found mostly on the upper reaches of Alberni Inlet and beyond, which are leeward slopes of mountains. Some areas along the outer coast, which are distant enough from the mountains to receive reduced rainfall, are in the dry subzone. Yuquot is more or less transitional between these subzones, but tends to fall within the lower limits of the wet subzone.

Each major geographical division of the coastline includes both outside and inside settings. Although the southern Nootkan coastline from Cape Beale to Glacier Point has few inlets (really harbours) even in short inlets like San Juan Harbour, both settings are present but in compressed form, as indicated by the economic round of the Pachenat (E.Y. Arima unpublished data). Hesquiat Harbour is probably the most extreme example of outside-inside compression on the West Coast. The geographical divisions of sounds with converging inlets and major Nootkan "tribal" units correspond well to each other. Each major Nootkan "tribal" unit (for example, Nuchatlaht, Moachat, Clayoquot, etc.) developed a fit to the ecological systems within its two-part geographical unit. Let us now see how this operated with the Moachat of Nootka Sound, and then attempt to derive a cultural principle of ecological orientation.

The Moachat Annual Round

The annual economic round of the Moachat, synthesized here from several sources (Drucker n.d., 1951: 36-66, 115-17, 228-52; Jewitt 1807, 1974; Bentley n.d.; Moziño 1970; Folan 1972a; Murphy 1957; British Columbia 1916; Turner 1975, 1978), was scheduled to exploit seasonal fluctuating resources in both "outside" and "inside" settings by means of a two-part cycle. Scheduling of times and places within this cycle varied according to several factors: seasonal availability and quantity of species, weather, quantities of winter provisions, ownership of resource properties, and threat of warfare. Nevertheless, the two-part nature of the cycle is clear. Specific months and relocations of village sites in the synthesis are based on Jewitt's record from 1803 to 1805.

The outside part of the cycle began in late February when winter provisions were exhausted and food was less plentiful. Households moved from their inside winter village sites to Yuquot, which served as a base for access to a wide range of marine resources. In this respect the location of Yuquot is important because Yuquot is the most sheltered

Moachat outside village site near the outside-inside interface at Nootka Sound. If the weather was too bad for ocean travel on the outside, abundant epifaunal molluscs, other marine invertebrates, rockfishes (*Sebastes* sp.) and coast deer were available. In late February and early March chinook salmon (*Oncorhynchus tshawytscha*) appear and were taken on trolling hooks. In late march or early April fences of hemlock boughs were set in the coves to collect herring spawn. About this time the favourable spring weather arrived, and with it, migratory waterfowl. Groups of people went to outside sites in Nootka Sound and on the outer coast of Nootka Island. There they fished halibut, cod, lingcod, rockfishes and kelpfishes that inhabit the offshore banks and reefs. Whales, seals and sea otters were hunted at this time and on into the summer. In late spring women sought sprouts of the thimbleberry (*Rubus parviflorus* Nutt.) and salmonberry (*R. spectabilus* Pursh.) and cow parsnip stalks (*Heracleum lanatum* Michx.). As various berries and fruits ripened from June through August, they were gathered: salmonberries, thimbleberries, blackberries (*R. ursinus* Cham. and Schlecht.), red huckleberries (*Vaccinium parvifolium* Smith), blueberries (*V. ovalifolium* Smith), wild strawberries (*Fragaria* sp.), crabapples (*Pyrus fusca Raf*.) and rose haws (probably *Rosa nutkana* Presl.). In late summer women dug clover roots (*Trifolium wormskjoldii* Lehm.) and camas bulbs (*Camassia quamash* Pursh.). In August drives were made on shiners and perch. Eggs from a second herring spawning were collected on bough fences.

In late August and early September frequent rains begin and signal the start of the "inside" part of the cycle. The rains fill the lowered and dried-up streams in the inlets so that the salmon can ascend for spawning. At the end of August households left Yuquot for their fishing camps or local group sites on the "inside" to take salmon by means of weirs, traps, leisters and harpoons. The salmon was smoked and dried for winter provisions. Late ripening berries and fruits listed for the outside also grow on the inside. In September salal berries (*Gaultheria shallon* Pursh) were collected and dried in cakes for winter provisions. In late fall several roots and berries were gathered: bracken fern rhizomes (*Pteridium aquilinum* L.), silverweed roots (*Potentilla pacifica* Howell), skunk cabbage roots (*Lysichitum americanum* Hultén and St. John), sword fern rhizomes (*Polystichum munitum* Kaulf.), spiny wood fern rhizomes (*Dryopteris austriaca* Jacq.) and winter huckleberries (*Vaccinium ovatum* Pursh).

By mid-November a large quantity of salmon had been put up for winter provisions, and households moved from the local group fishing sites to winter at tacīs. There they endured the constant rains in feasting, potlatching and Lōqwanå. Households relied on their winter provisions and reduced subsistence pursuits mainly to gathering winter huckleberries, trapping kelpfish and perch and angling for cod and red snapper. Deer and bear were taken in deadfalls. At the end of December households moved down Tahsis Inlet to kūptī to await the herring run and to do offshore fishing. By late January winter provisions were either greatly depleted or exhausted. After taking the eagerly awaited herring run, the households moved in late February from kūptī to Yuquot for mollusc gathering and trolling for spring salmon, thereby recommencing the outside part of the cycle.

The history of the Moachat confederacy (Drucker 1951: 228-31) indicates that the above described cycle involving the 16 major sites recorded by Drucker, covering all of Tahsis Inlet, Tlupana Arm, Nootka Sound and the outside of Nootka Island, is, like the Moachat confederacy, probably a post-contact development in the 19th century. The ever constant competition of native groups by means of marriage, alliances, warfare and assimilation of weaker groups for control of the limited economic resources at Nootka Sound was intensified by European contact and its effects, which affected the balance of power among native groups. The competitive process among native groups to maximize ownership of economic resources was probably first intensified in the late 18th century when the maritime fur trade and Spanish occupation of Yuquot gave the Yuquot Nootkans an economic and military advantage over neighbouring native groups in Nootka Sound. Therefore, other sites and different relocations may have been involved formerly in the annual cycle, but their role in the cycle may have changed due to political changes or lack of productivity. In short, the Moachat annual cycle, *in its historically recorded specific details*, can be projected back in time with reasonable certainty to the late 18th century.

The ecological basis of the Moachat cycle and its polity, however, reveals cultural capacities and orientation that underlie Nootkan cultural ecology. Central to this discussion is the adaptive advantage of whale hunting and the cultural capacity of some Nootkan groups to be exclusively adapted to one major geographical setting. According to Nootkan tradition, whale hunting was an indispensable part of the food quest among some groups who lived year-round on the outer coast. Conversely, other groups are reported to have preferred the "inside" and had little prowess in sea mammal hunting or deep-sea fishing. Let us examine these examples of adaptation exclusively to one geographical setting, but within the contexts of the two-part cycle, and derive a cultural principle underlying Nootkan ecological orientation.

An exclusive adaptation to the "outside" is suggested by four northern Nootkan groups (ɛ'asåth, tsaxsisåth, tatcūåth and wɔxnɛ'åth), who reportedly lived year-round on the outer beaches (Drucker 1951: 226, 228). There are no salmon streams of consequence in their areas, so the ɛ'asåth, tsaxisåth and tatcūåth apparently compensated by inventing whaling (Drucker 1951: 49, 228). It is said these groups relied on whaling for their livelihood just as inside groups depended on salmon fishing (Drucker 1951: 49).

If Maquinna's record as a whaler (Jewitt 1807; Smith 1974; Drucker 1951: 50) is typical, whale hunting could not have provided a reliable, consistent food source in the way that salmon fishing did. It is also improbable that whales could be taken in the winter or preserved for winter consumption. The long winter storms make outside sea travel almost impossible, thereby precluding whale hunting. Also, the two species of whales hunted are rare in the fall and winter. The migrating California gray comes in close to shore in April, and the humpback enters protected bays and inlets in the summer (Pike and Giovando 1963; Cowan and Guiget 1965). Assuming that enough whales could be taken in the fall for winter provisions, the Nootka do not seem to have preserved the meat in any quantities. Although small amounts of whale meat were dried (Drucker 1951: 253), the Nootkans directed their efforts to distributing and consuming it as soon as possible. It is apparent from the two-part cycle that whale hunting played a relatively small part in Nootkan subsistence. In terms of scheduling, the subsistence value of whale hunting lay in providing a great deal of food in the spring when winter provisions were used up and food was more difficult to obtain. Whales beached or washed up on shore may have provided more food than those successfully hunted. It should be recognized that harpooned whales that escaped the hunters probably died of their wounds, became drift whales and were later recovered on the beaches. The importance given to whale hunting by both Nootkans and whites lies less in subsistence value, and moreso in a heroic, romantic feat symbolical of a chief's greatness. Whale hunting was a chiefly privilege restricted to a relatively small number of people in the society.

Tradition also refutes the exclusive adaptation of the four northern groups. The tatcūåth and wɔxnɛ'åth found wintering on the open coast too much of a hardship and confederated with the Ehetisat to get winter quarters at hōhk (Drucker 1951: 226). The tsaxsisåth became the nayitsa'åptakåmƛåth, who sought inside holdings in the formation of the Moachat confederacy (Drucker 1951: 228-9). The ɛ'asåth broke into two groups; one joined the Nuchatlet confederacy, and the other became the yaƛūactakåmƛåth, who obtained rights to kūptī and played a key role in the development of the Moachat confederacy (Drucker 1951: 228-230).

Two Nootkan groups, the Muchalat and the Hopachisat, might be singled out for exclusive adaptation to the "inside." There are indications, however, that at least one Muchalat group had whaling rights at hōmīs (Drucker 1951: 232) and were formerly more active in Nootka Sound. The inside isolation of the Muchalat more likely resulted from lengthy warfare with the more powerful Moachat than from preferred exclusive adaptation. The Hopachisat, with their exploitation of rivers at the head of Alberni Inlet and the Great Central and Sproat lakes, were undoubtedly an "inside" riverine people. The Hopachisat, however, were originally a Salishan people, who became Nootkanized after Tsishaat expansion into the head of Alberni Inlet in the early historic period (Boas 1890: 584).

Additional examples further refute exclusive adaptation to either an inside or an outside setting. Most importantly, they show that a major concern of Nootkan groups was to have rights to resources in both settings. When the outside tatcūåth and wɔxnɛ'åth confederated with inside groups to obtain winter quarters at hōhk, the inside groups were given in return rightɛ to whale and fish halibut off tatcū (Drucker 1951: 226-7). Among the Hesquiat, the outside kīqinåth coveted the salmon streams of the hōmīsåth and took the winter site of hɛckwī by force (Drucker 1951: 236-7). The Tlupana Arm groups sought summer sites on the outside and obtained rights on the east shore of lower Nootka Sound (Drucker 1951: 230). At Nootka Sound, the tsaxsisåth, who lived year-round on the outer coast, seized the rich, more sheltered maritime site of ɛ'as and acquired rights to inside salmon streams through alliance with the amitsa'åth (Drucker 1951: 228-9). The Moachat acquired the rich salmon streams at tacīs through warfare with the Nuchatlet. The Ahousat were formerly a small local group at tsatikwīs, with the sites of ahaus and tcītapī - all outside sites with no salmon streams; guns traded from the Moachat in the early historic period enabled the Ahousat to conquer their more numerous Otsosat neighbours who owned rich inside salmon streams (Drucker 1951: 238-9). At Clayoquot Sound, the La'ō'kwåth, an inside group on Kennedy Lake, allied with the neighbouring kwɔkLåsåth, apwanåsåth, aqōwitisåth and ciwɔåth and conquered the outside hisau'iståth for their lands, names and privileges (Drucker 1951: 240). The La'ō'kwåth also extinguished a small Ucluelet lineage that owned tcu'is on Clayoquot Sound (Drucker 1951: 242). The outside Ucluelet had no significant salmon stream that could support all their people, so they conquered the Namint for their rich stream (Swadesh 1948: 78-9, 84).

These recurring examples show that the political dynamics of the northern and central Nootkans was a series of constantly shifting and reforming alliances between local groups and tribes (interrelated local groups in close proximity) to obtain maximum seasonal exploitation of limited fluctuating resources in both geographical settings. In terms of cultural ecology, the above examples indicate that Nootkan culture did not enable groups to live well year-round in one major geographical setting. In particular, life on the outside was such a hardship, even with whaling, that one group would annihilate another to gain resources on the inside. The above examples and the Moachat annual round indicate adaptation to both "outside" and "inside" settings, but on a *seasonal*, rather than annual, basis. Thus, the cultural principle underlying Nootkan ecological orientation is adaptation to the two major environmental settings (outside and inside) *on a seasonal basis, but without exclusive adaptation to either setting*. This cultural orientation has likely been in effect for centuries, because the coastal environment has remained fairly constant for the past 3000 years (Heusser 1960), and the Yuquot artifact assemblage covering that period does not reflect a more maritime-oriented culture than Nootkan culture known ethnographically. In fact, the ethnographically known Nootkan maritime orientation appears from the Yuquot archaeological record to be a relatively late phenomenon. This will be demonstrated later in the report.

Archaeological Manifestations of the Subsistence Cycle

Limited surveys of Moachat sites (Folan and Dewhirst 1966; McMillan 1969) reveal significant archaeological differences between outside and inside sites. These differences reflect use of the site either as a base for exploitation of a wide range of resources, or as a station for exploitation of a few primary, immediate resources. The archaeological manifestations of these activities are affected by certain environmental factors.

The Moachat outside village sites lie on the open south coast of Nootka Island, an unindented shoreline with shingle beaches, rocky headlands and reefs. In winter long severe storms lash these shores, making travel by small watercraft impossible. Even during the mild summer months large swells and heavy seas are not uncommon. There are few sheltered places suitable for village sites, which probably accounts for the fact that only three are known at present: tsaxsis, ɛ'as and Yuquot.

tsaxsis at the mouth of Beano Creek is the most exposed. This site was probably preferred more as a fishing station than as a long-term village site, because a small salmon run ascends Beano Creek, and no shell mound or other indications of intensive occupation could be found. The beach is completely unprotected. There are no nearby reefs or rocks teeming with marine life. According to legend (Drucker 1951: 228) the tsaxisåth took ɛ'as by force, which perhaps indicates marginal suitability of tsaxsis as a village site.

ɛ'as and Yuquot are typical of large outside village sites. Both are lowlying, supporting deep shellmounds several hundred feet long, separate from stream mouths and other natural erosive agents. The high shell content, built up over centuries of intensive occupation, neutralizes the acidic soil and improves preservation of organic remains. Of the two sites, Yuquot is larger, more sheltered and more elevated. It has the best beach and water supply and is closest to sites on the inside. Both ɛ'as and Yuquot are not known for a specific primary resource; rather, they served as bases for exploitation of a wide range of nearby and distant resources. The large reef fronting ɛ'as and the rocky headlands forming the south and east sides of Friendly Cove provide several tidal and offshore resources: epifaunal molluscs, barnacles, sea urchins, seaweeds, rockfish, kelpfish and seabirds. Cod and halibut grounds lie offshore. Salmon pass the sites en route to spawning grounds on the inside. Sea mammals follow the salmon. Deer can be taken at both sites.

Inside sites are found at or near the mouths of streams. The sites are small, often less than 300 ft. long, low lying and close to shore. Midden deposits are very shallow; sampling at kūptī, one of the more built-up inside sites, revealed cultural deposits with a maximum depth of 8 ft., but deposits were generally only a few feet deep (McMillan 1969: 61-2). The presently known inside sites with their shallow middens also appear to have shallow time depth. Artifact types from kūptī (McMillan 1969), so far the only inside Moachat site sampled, are the same as diagnostic types from Zones III and IV at Yuquot, thus suggesting an occupation of kūptī no earlier than ca. A.D. 800. Given that coastal environments have been stable for the past 3000 years, and that one-half of the Nootkan subsistence cycle was oriented to a finite number of logistically exploitable sites, it is curious that the ones so far known should indicate shallow time depths and relative lack of intensive occupation on the inside.

One may hypothesize that in earlier times Nootkans were more oriented to the outside, and that their culture evolved to exploit inside resources, thereby accounting for the apparent recent, slight occupations of the inside sites. However, as mentioned earlier, and demonstrated later in this report, Nootkan culture before A.D. 800 was less maritime oriented.

Instead, the problem of apparent shallow time depth and slight occupation of inside sites is probably due to environmental and cultural factors. The large outside sites, such as Yuquot, served primarily as a base for exploitation of a wide range of resources within several miles of the village: epifaunal molluscs, halibut and cod grounds, offshore rockfishes, seal rocks, herring spawning coves, herring runs, salmon runs, waterfowl and land game. In contrast, the inside sites are tied to exploitation of a few primary resources, especially salmon streams, in the immediate vicinity. Indeed, the inside sites are known especially for their specific resources; for example, ō'wīs translates roughly as "gathering place of the salmon" and hisnit is based on the word for sockeye (Bentley n.d.). Given the heavy rainfall and erosion at Nootka Sound, it is likely that over a period of several centuries, streams formed different courses, at times became blocked or might not have supported salmon runs large enough for native exploitation. Changes in a stream would also adversely affect other immediate related resources such as clam beds and waterfowl. Therefore, as availability of resources changed and as river mouths of sites changed through the years, it is likely that other sites were exploited, and that other locations in the vicinity of present sites were occupied. The time depth of inside sites might be determined by survey and extensive testing of areas at the mouths of large streams which were probably present thousands of years ago: Gold River, Burman River, Tsowwin River, Tahsis River, Leiner River and the Tlupana River. Areas formerly occupied at these river mouths will probably be difficult to detect. Flooding or altered course of the river may have washed away traces of earlier occupation. On the other hand, eroding banks may reveal early remains covered by overburden.

Early remains at inside sites will be more difficult to recognize than those at the large outside sites, owing to short-term occupations by small numbers of people and poor preservation of organic materials. Most inside sites were associated with fall salmon fishing, and occupied by a few local groups during the salmon runs. (Jewitt curiously mentions only tacīs and kūptī as inside Moachat villages and refers to "the whole tribe" moving between them, but this is perhaps an early stage of the confederacy phenomenon, because 18th century visitors noted that separate groups of people were living in Tlupana Arm and other places on the Sound.) The *Mytilus californianus* which makes up the bulk of outside middens does not live in the inlets or near stream mouths. *Mytilus edulis* lives in the inlets but is generally small and sparse there. Consequently, the primary molluscs available on the inside were infaunal species that require brackish water and sandy, gritty deposits. The limited availability of clam beds at inside sites can seriously affect the preservation of organic materials. As mentioned previously, calcium carbonate can leach out of the shells in sufficient quantities to neutralize the acidic rainforest soils. Therefore, at sites where few, if any, molluscs were consumed, we should expect to find that mainly stone artifacts and fire-cracked rocks remain. Furthermore, the unneutralized acidic soil will support a plant cover like that of the surrounding rainforest, thereby making recognition of early inside sites even more difficult.

A further archaeological manifestation of the cultural ecology is that different combinations and types of archaeological remains will probably be found at sites having different cultural-ecological orientations. The profound implications of the ecological pattern for archaeological analysis have been discussed at length (Abbott 1972); briefly, no single site will reflect the total culture of any group, and markedly different assemblages at contemporary sites can have been produced by the same cultural entity. While this is true in an absolute sense, significant differences in artifact types from major habititation sites, in Nootka Sound at least, may be less pronounced than one would think. Just as the Moachat were adapted seasonally to two geographical settings, most of the portable fishing and hunting gear described by Drucker (1951) was used in both the outside and inside. The only outside gear that might not be found on the inside is specialized equipment for species restricted to the outside: perhaps U-shaped halibut hooks and whaling harpoons. Moreover, it should be kept in mind that such items were likely transported to inside sites during seasonal relocation and theoretically could be found archaeologically. Furthermore, a limited archaeological sample from the inside winter village site of kūptī suggests that the same types of artifacts were used in both geographical settings. All the native artifacts described for kūptī (McMillan 1969), except for some pebble tools and a ground scapula, are also found at Yuquot. A larger artifact sample is needed, of course, from kūptī and other inside village sites to define the use of most artifact types in both geographical settings. Differences may be expressed in ratios of artifact types. Profound differences in artifact inventories between sites will no doubt occur in the very specialized sites, such as sealing camps, fishing stations and ceremonial caves.

The Site

Yuquot in 1966

Yuquot (Figs. 1-4) is a typical Nootkan outside village situated at Friendly Cove on the southeastern tip of Nootka Island (49°35'36" N. latitude; 126°37'06" W. longitude). Three topographical features form Friendly Cove and the site setting. To the north is the rocky land mass of Nootka Island. A large spit about 200 yd. wide juts southward from Nootka Island for about 500 yd. to connect to a rocky headland.

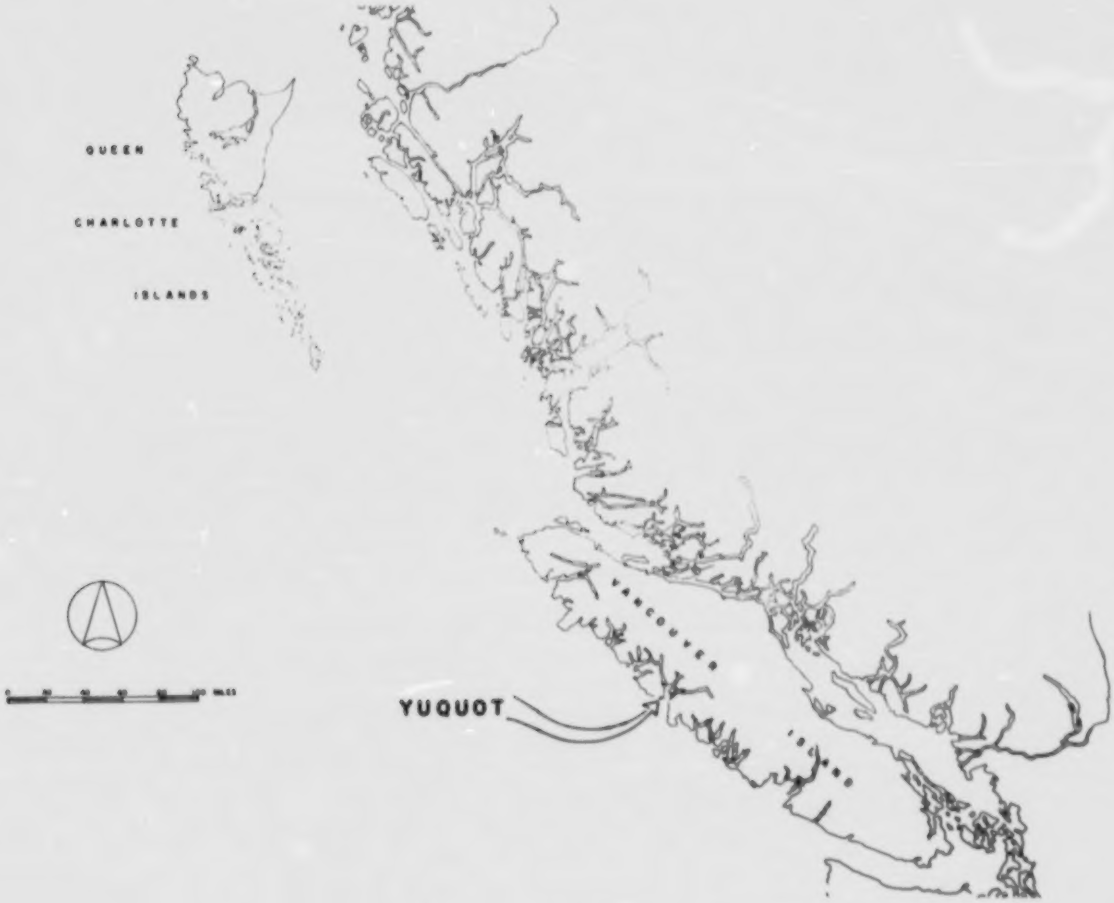


Figure 1. Location of Yuquot in relation to the west coast of Vancouver Island and the coast of British Columbia.

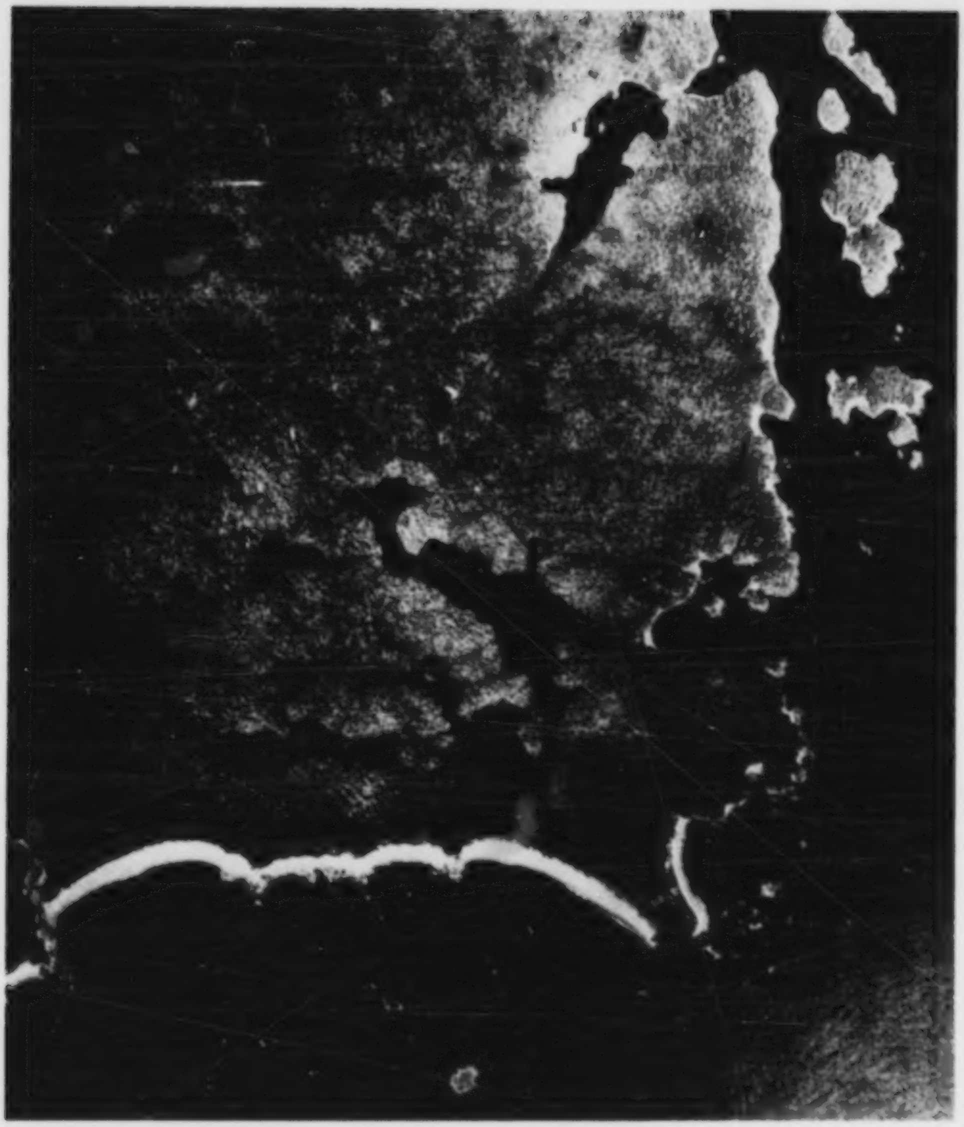


Figure 2. Aerial photo of Yuquot and environs in 1946. Yuquot, situated on the southern tip of Nootka Island, is near the outside/inside interface. Northeast of Yuquot is Cook Channel which connects to sheltered Tahsis Inlet and Tlupana Inlet. Westward are the outside beaches. The large body of water near the village is Jewitt Lake. (Original photograph supplied by the Surveys and Mapping Branch, Department of Energy, Mines and Resources.)

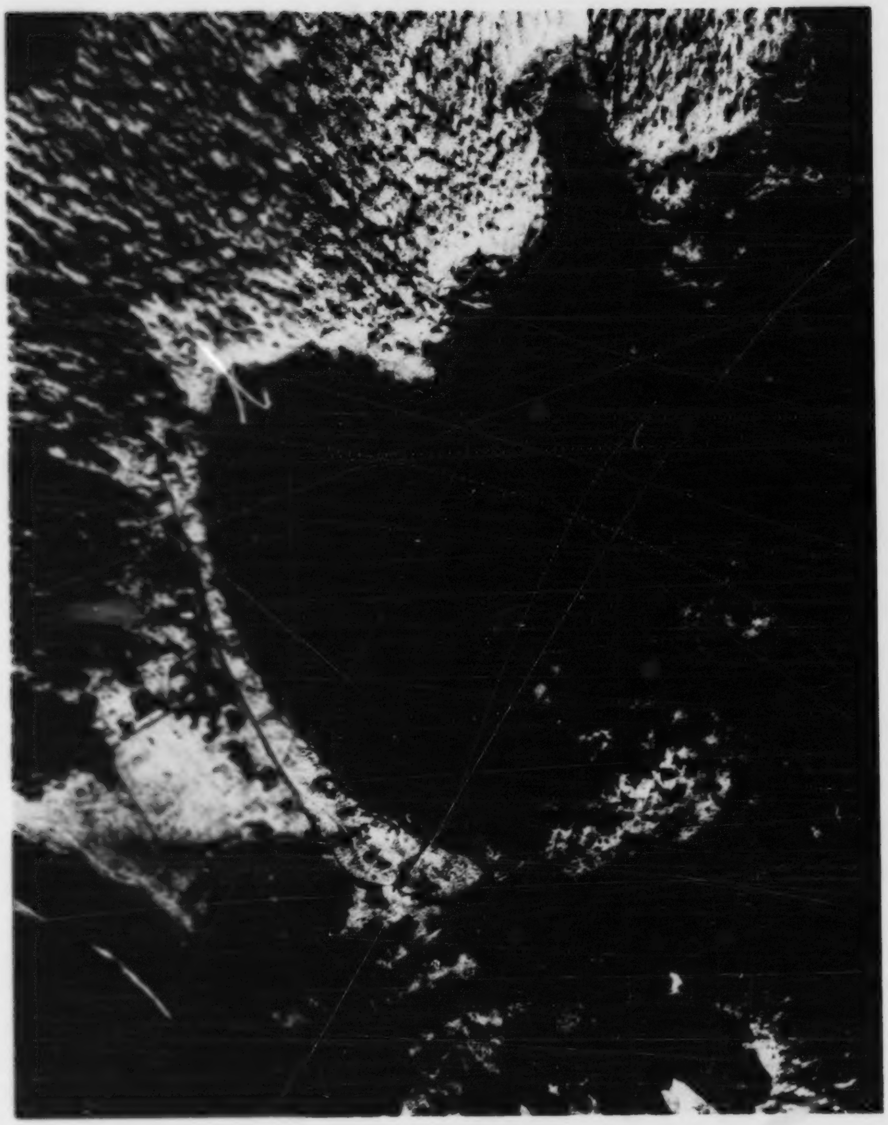


Figure 3. Yuquot and Friendly Cove seen from 1900 ft., September 1966. Excavation grid squares can be seen on San Miguel Island at the south side of the entrance to Friendly Cove. The dark soil amid the houses in the middle of the village marks the location of the excavation and backdirt piles. (Original photograph supplied by the Surveys and Mapping Branch, Department of Energy, Mines and Resources.)

South and east of the headland are the San Miguel Islands, a group of rocky islets that connect to the headland and to one another at low tide. The eastern islets form the south side of Friendly Cove. The highest and largest island of the group, San Rafael, is the site of the Department of Transport lighthouse. The easternmost islet of the San Miguel group is at the entrance to Friendly Cove. This islet has no official name. It was the site of the 18th century Spanish gun battery, Fort San Miguel, and for convenience is referred to in this report as San Miguel Island. In the early 1960s construction of stone causeways further linked San Miguel to San Rafael, and the latter to the spit.

Figure 4. Yuquot, September 1966.

The modern village of Yuquot rests on a large midden and site of the 18th century Spanish military post of Nutka. Two rows of frame houses run in a north-south direction parallel to the shore. In 1966 about one-half of the houses were either seasonally occupied or completely abandoned. By 1978 most were torn down. The northwest corner of Friendly Cove, separated from the village by a large rock outcrop, was the 18th century site of Meares' factory. In the 1890s or early 20th century, a small Roman Catholic church and priest's house was constructed here. In the 1950s the church burned down, and a large church with living quarters for the priest was built on the southwest corner of the spit, near the west beach. The central area of the spit consists of a large playing field. At the north end of the field is an Indian Affairs Branch day school and teacherage. About 400 yd. northwest from the school is Jewitt Lake, which lies within 100 yd. of the sea. The land about the lake, and on Nootka Island generally, is shrouded in dense west coast rainforest. Seaward is the open Pacific. The west beach, headland and San Miguel Islands protect the cove only when the wind is blowing from the west, south and north.

The Midden

The midden on which the modern village of Yuquot rests lies on the east side of the spit that forms the western shore of crescent-shaped Friendly Cove. Owing to surface disturbances, modern dwellings, overburden and vegetation, we could not determine the exact limits of the midden, its dimensions and all topographical features associated with it. However, the location and area of the midden do correspond well to those of the modern village in 1966 (Figs. 3-5). Midden

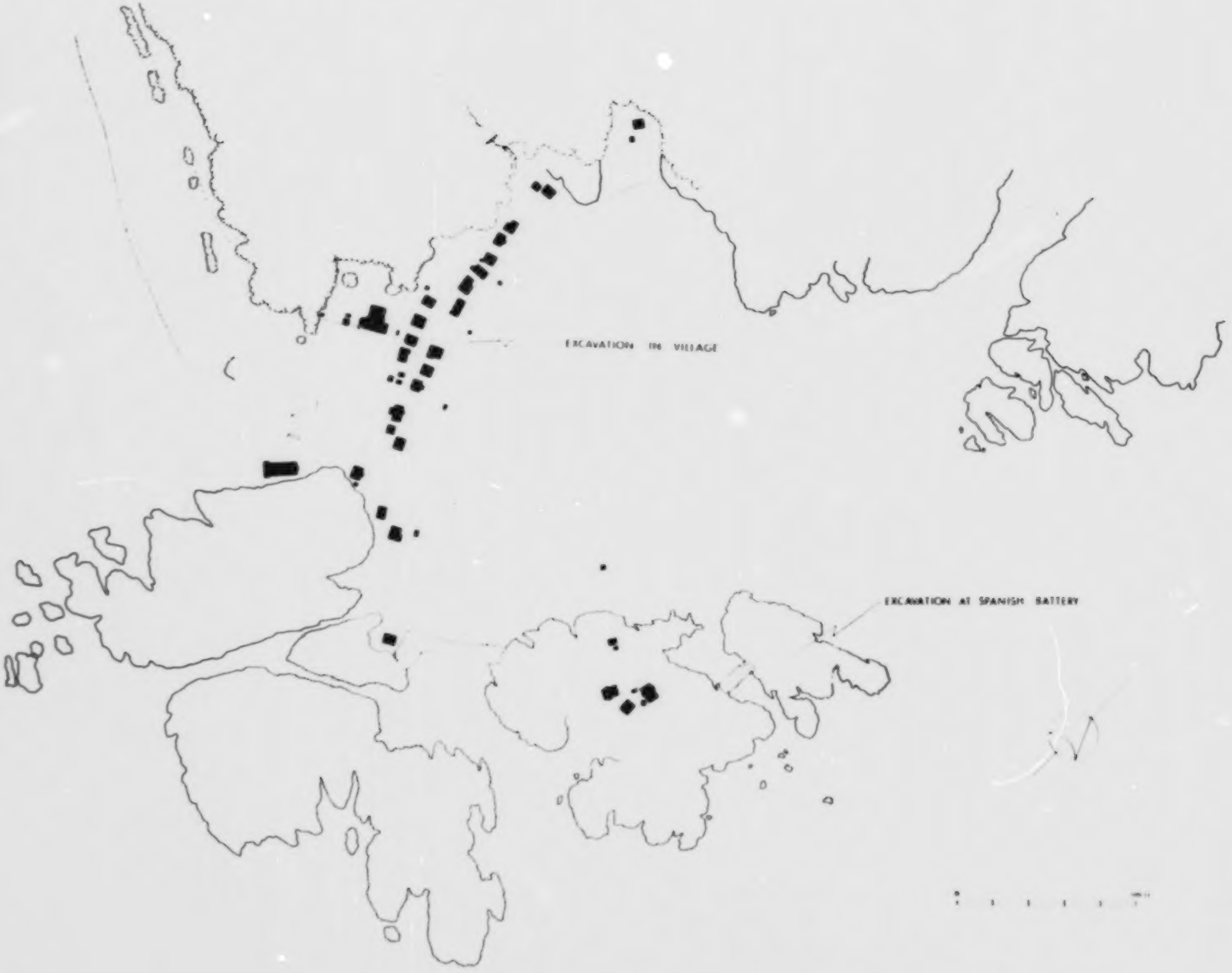

EXCAVATION IN VILLAGE
EXCAVATION AT SPANISH BATTERY

Figure 5. Plan of Yuquot in 1966 showing houses and structures in village, Department of Transport facility on San Rafael Island and locations of excavations.

deposits run parallel to the beach for about 700 ft., from near the rock outcrop at the north end of the village to the house just north of the dock at the south end. These midden deposits form much of a 15-ft. high bank which rises between the beach and the first row of modern houses (Figs. 3, 4, 6). The upper part of the slope has been levelled to form a gravel and dirt walkway which runs in front of the first row of houses. The ground on which these houses rest rises gently for 5 to 10 ft. above the walkway, and then more or less levels off. This area, particularly along the second row of houses, is the crest of the midden, with a maximum elevation of about 35 ft. above mean sea level (MSL). Behind the second row of houses the midden slopes downward from 5 to 10 ft. in elevation to the large playing field and day school and teacherage. Construction of the playing field removed the western edge of the midden, so that in the middle of the village midden deposits extend only about 220 ft. westward from the beach. At the north end of

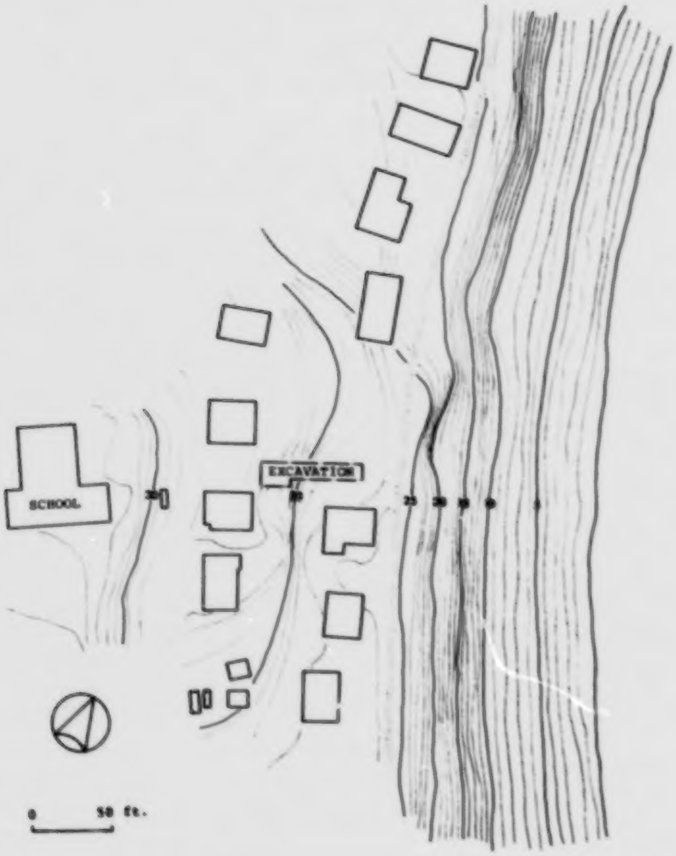


Figure 6. Site plan of excavation area in village.

the village, where a rock face stands behind the houses in the first row, midden deposits may extend only about 100 ft. westward from the beach. Some shallow midden deposits are likely present in the northwest corner of the cove, known as "Meares' Corner." These could not be located, however, due to a modern cemetery, a former priest's house, dense undergrowth and a stream running through the area. There are no midden deposits on the outer (western) beach of the spit. The linear area of the midden described above, excluding Meares' Corner, is an estimated 16,840 sq. ft. We do not know the depth of midden deposits, but on the crest of the mound they extend for more than 18 ft. below the ground surface. Assuming the deposits average 14 ft. below the surface, the midden would have an estimated volume of 235,760 cubic ft.

Excavations

Two separate excavations were undertaken at Friendly Cove. One was at the site of the Spanish gun battery on San Miguel Island at the entrance to the cove. The other was in Yuquot village.

The site of the gun battery or Fort San Miguel was initially investigated in 1961 by John Thomson, in association with the historian Tomas Bartroli (Thomson 1961a,b). A small trench yielded a few European artifacts, including the lock of a northwest gun. No structures or significant features were uncovered.

Our excavation of the gun battery was first intended to be total: to expose all structural remains and to record all artifacts and their stratigraphic contexts three-dimensionally. All surface vegetation, consisting of largely moss, salal and other small shrubs, was removed from a large flat area on the top of the island. The desodded area was then swept clean to expose any structural remains that might project to the surface. An occasional large angular unshaped rock was located, but these were later found to form no pattern, and to have no apparent structural significance. A grid was imposed on the site, and excavation began in a chequerboard fashion of alternate 5-ft. grid squares (Fig. 7). One set of alternate grid squares excavated to bedrock revealed a very shallow homogeneous layer of decayed plant material ranging from a few inches to 30 in. deep, depending on the contours of the underlying bedrock. Because only a few 19th and 20th century European or Eurocanadian artifacts were recovered and no structural remains were encountered, we discontinued excavation with one-half of the grid squares unexcavated. The few artifacts recovered are included in the analyses of non-indigenous artifacts from Yuquot village.

The excavation in Yuquot was affected by several factors. Initially, we planned to locate and excavate the sites of structures of the Spanish military post of San Lorenzo de Nutka (1789-95) and Meares' factory (1788-95?), but found that modern houses occupied the probable locations of the Spanish structures (indicated in Moziño 1970: figs. 3, 13). The site of Meares' factory was occupied by a former priest's residence, an overgrown graveyard and former site of a Catholic church. Limited testing in any of these areas was not permitted because the residents of Yuquot wished to be as undisturbed as possible by the

Figure 7. Beginning excavation on San Miguel Island after desodding.

archaeology. With this in mind, (then) chief councillor Edward Jack chose an inactive area for the excavation, amid abandoned houses on the midden crest near the middle of the village (Figs. 6, 8). This location also appeared to be in the general area of the Spanish troop quarters which had consisted of three small buildings. A grid of 5 ft. squares was imposed on the crest of the mound. Desodding and the first few feet excavated here revealed no structural remains.

We then decided to extend the excavation area from these squares

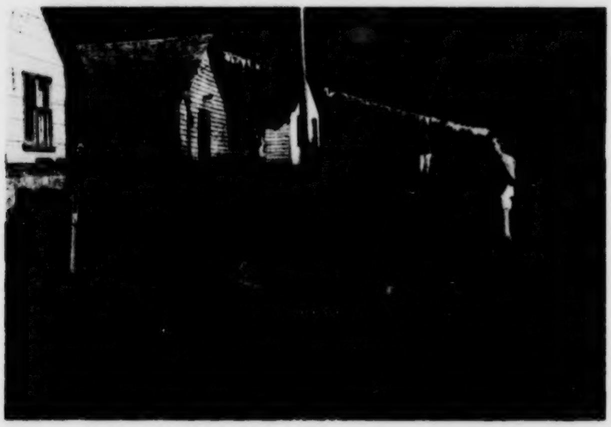


Figure 8. Excavation area on the midden crest at Yuquot before desodding.

into a trench across the mound and down to the beach. This would reveal the structure of the midden. Such a trench would also cut across known activity zones which ran more or less lengthwise in the village, and thereby provide a sample more representative of village culture. The crest of the mound and modern first row of houses were clearly areas of large multifamily planked dwellings with permanent house posts, certainly in the historical period, and likely before. The area opened by the trench in the first row of modern houses was the south side of the site of Captain George's 20th century nisaqath big house. The trench appears to have straddled the south edge of the nisåqåth property and the north edge of the haiyanūwəctåkamƛåth property. The area between the present gravel pathway and beachward slope often supported plank platforms. The slope down to the beach and its base were used for fish drying racks, and in the historic period, gardens. This slope was also likely a garbage dump for the big houses above it. At times temporary small planked houses were erected against the slope; in the 20th century these consisted of small frame shacks. Such dwellings were occupied by the lower classes of Nootkan society: the poor with no benign relatives, the ostracised and perhaps vassal groups. The upper strip along the beach was probably an area of many activities: repairs to canoes and fishing gear, a temporary position for items being loaded or unloaded and probably a garbage dump.

The trench, however, could not be extended past the big house area. At the beginning of the excavation we did not imagine that cultural deposits would exceed 18 ft. below the midden crest. The underestimated depth of cultural deposits, slumps and heavy rains late in the season slowed down the excavation and prevented the trench from reaching the beach.

The excavation employed a control and recording system combining both arbitrary levels and natural stratigraphic units (Folan and Dewhirst 1966). A grid of 5-ft. squares was imposed on the midden. Each grid square was excavated in 0.5-ft. arbitrary levels coordinated below a common datum elevation. Each level was carefully measured overall below the datum elevation to avoid digging into the next level. A plan drawing was made of each square at each 0.5-ft. level. All stratigraphic units within each level were excavated separately and recorded on the plan drawing and on sample bags. Artifacts found in context were recorded three-dimensionally and plotted on the plan drawing. Charcoal samples were treated in the same way as artifacts. The stratigraphic units were troweled. The soil from each stratigraphic unit within a level was sent separately in colour-coded buckets to be dry screened through 3/8-in. mesh hardware cloth (Fig. 9). All faunal materials, artifacts and suspected artifacts and faunal materials found in the screen were put back into the bucket, which was then returned to the grid square where the materials were deposited in a lot bag for the individual stratigraphic unit from which they came. This allowed later separation of materials according to stratigraphic units for analysis. Grid squares were excavated alternately in a chequerboard fashion (Figs. 10-13). Profile drawings made of the grid square walls were later reassembled into profile drawings of the trench (Figs. 14, 15). Squares that were not being excavated were covered with sheets of polyethylene to prevent materials from different levels becoming mixed

Figure 9. The screens.

as a result of wall scrapings, wall droppings and slumps. As the excavation deepened, the grid squares were reestablished within the trench.

The excavation finally consisted of a trench 64 ft. long, with a maximum width of 15 ft. (Figs. 14, 15). Slumps on the north and south faces at the west end of the trench (squares A-D) increased the width on each by a further 5 ft. A slump also occurred at the west end of the trench. Once the fallen earth had been cleared away, it was decided to

Figure 10. Excavators record the position of an artifact below datum.

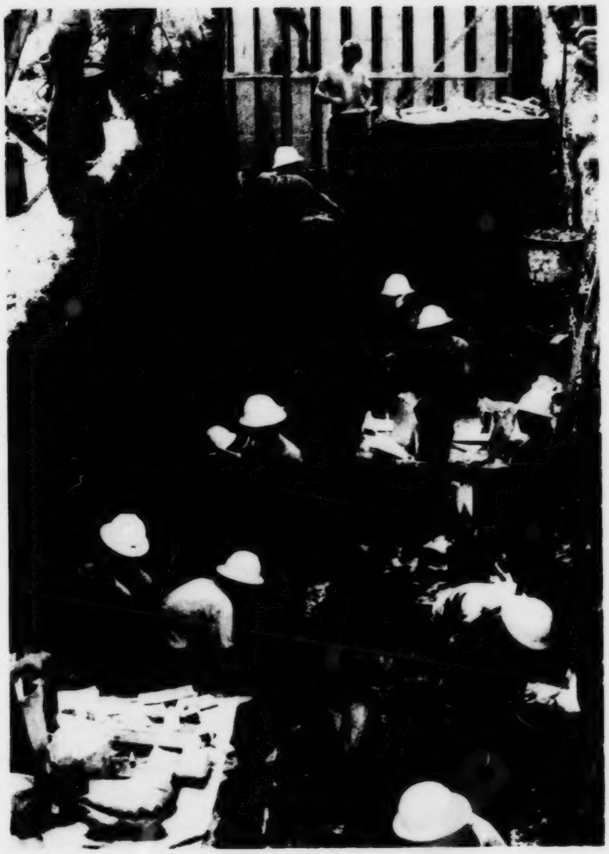


Figure 11. Excavation underway of squares D to J. An excavated rock-rimmed firepit can be seen near the centre of the photo.

excavate the intact strata, so the grid was extended westward by 4 ft. These 4-ft. by 5-ft. squares were designated "N." The west end of the trench was widest and deepest, and sampled the crest of the midden (squares N, A-C). The rest of the trench, only 10 ft. wide, cut into the slope between the first and second rows of modern houses (squares D-G), and then the edge of the former site of Captain George's house (squares H-M) by the first row of houses. The excavation reached a maximum depth of 18 ft. below the surface of the crest of the mound and 12 ft. below the surface of the former site of Captain George's house without encountering sterile deposits. The excavation occupied a linear area of 735 sq. ft., 4.36 per cent of the estimated linear area of the midden. The excavation removed a 8187 cubic ft., or approximately 3.5 per cent of the estimated volume of the midden.

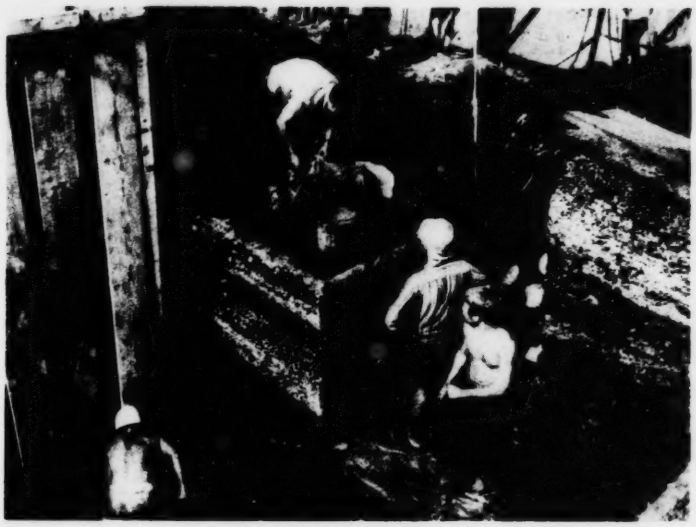
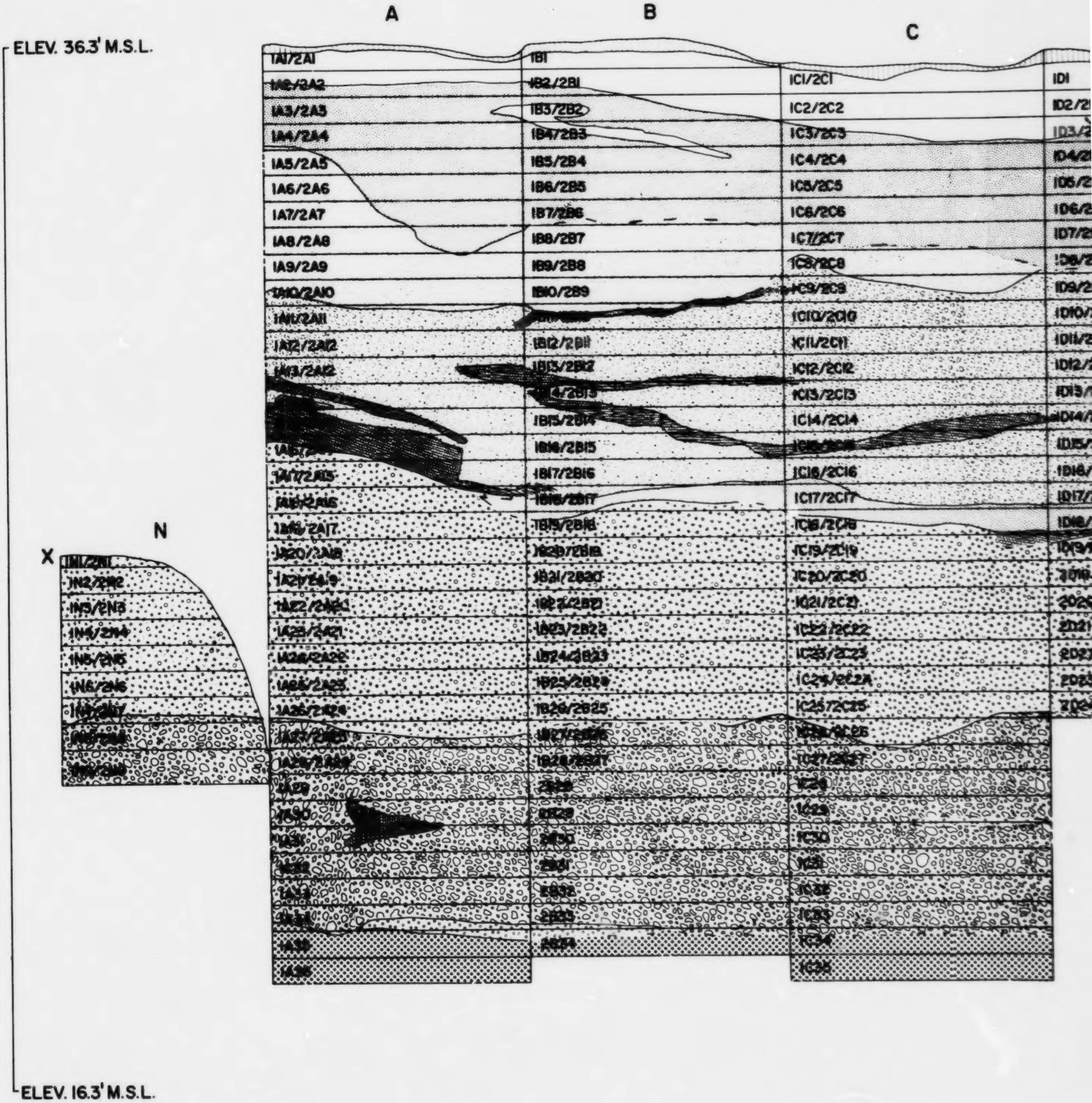


Figure 12. Well-stratified midden deposits of squares 1D, 2D and adjacent south face. The dark material with light shell flecks is Zone II. The light, finely stratified deposits above are Zone III. Zone IV deposits with well-preserved shell can be seen on the adjacent south face to the right. (Photo by M. Forde.)

Figure 13. Excavation of a whale scapula.


ELEV. 36.3' M.S.L.
ELEV. 16.3' M.S.L.
A
B
C
N
X
1A1/2A1
1A2/2A2
1A3/2A3
1A4/2A4
1A5/2A5
1A6/2A6
1A7/2A7
1A8/2A8
1A9/2A9
1A10/2A10
1B1
1B2/2B1
1B3/2B2
1B4/2B3
1B5/2B4
1B6/2B5
1B7/2B6
1B8/2B7
1B9/2B8
1B10/2B9
1C1/2C1
1C2/2C2
1C3/2C3
1C4/2C4
1C5/2C5
1C6/2C6
1C7/2C7
1C8/2C8
1C9/2C9
1C10/2C10
1C11/2C11
1C12/2C12
1C13/2C13
1C14/2C14
1C16/2C16
1C17/2C17
1C19/2C19
1C20/2C20
1C21/2C21
1C22/2C22
1C23/2C23
1C24/2C24
1C25/2C25
1C27/2C27
1C30
1C35
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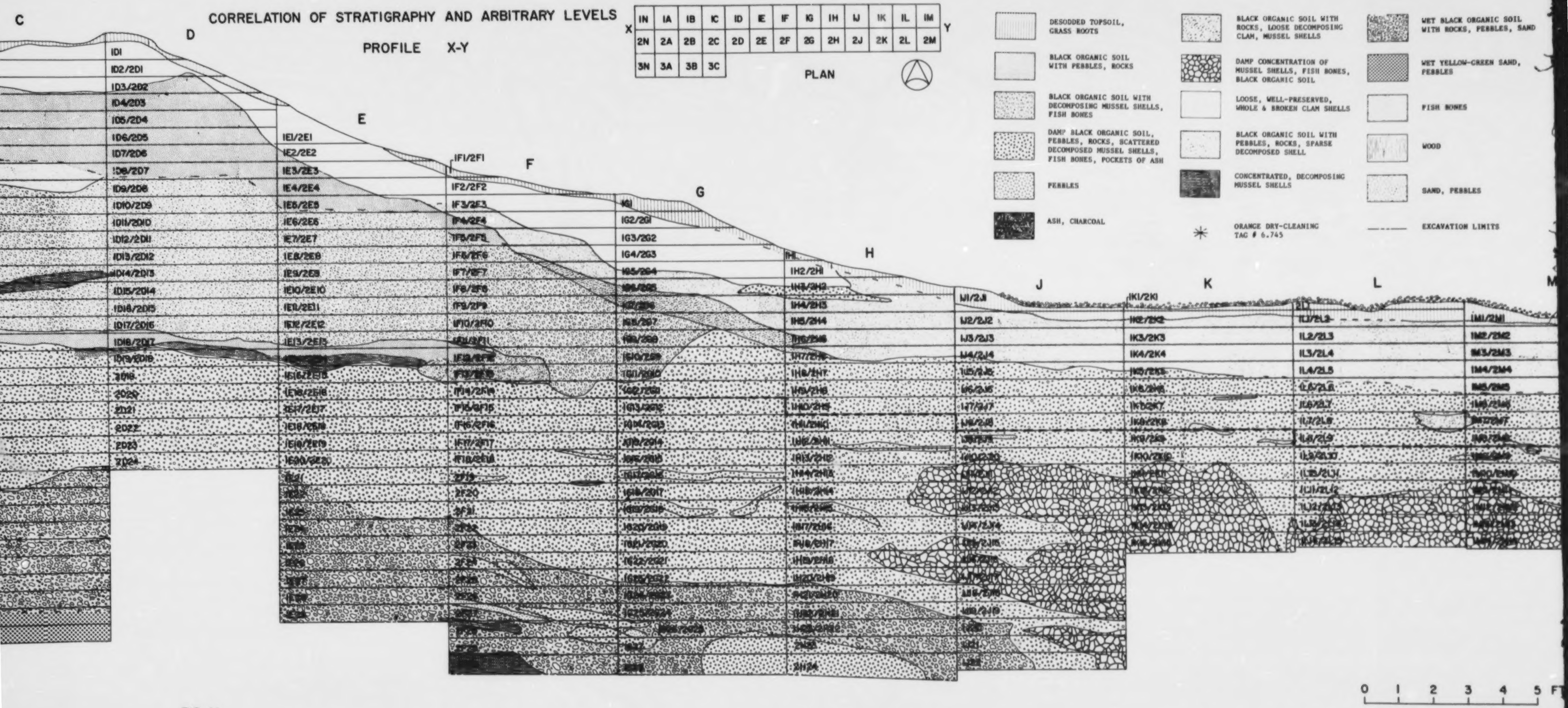
1N6/2N6
1A36


CORRELATION OF STRATIGRAPHY AND ARBITRARY LEVELS
PROFILE X-Y
X
IN IA IB IC ID IE IF IG IH IJ IK IL IM
2N 2A 2B 2C 2D 2E 2F 2G 2H 2J 2K 2L 2M
3N 3A 3B 3C
Y
PLAN
C
D
E
F
G
H
J
K
L
M
DESODDED TOPSOIL, GRASS ROOTS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS
BLACK ORGANIC SOIL WITH DECOMPOSING MUSSEL SHELLS, FISH BONES
DAMP BLACK ORGANIC SOIL, PEBBLES, ROCKS, SCATTERED DECOMPOSED MUSSEL SHELLS, FISH BONES, POCKETS OF ASH
PEBBLES
ASH, CHARCOAL
BLACK ORGANIC SOIL WITH ROCKS, LOOSE DECOMPOSING CLAM, MUSSEL SHELLS
DAMP CONCENTRATION OF MUSSEL SHELLS, FISH BONES, BLACK ORGANIC SOIL
LOOSE, WELL-PRESERVED, WHOLE & BROKEN CLAM SHELLS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS, SPARSE DECOMPOSED SHELL
CONCENTRATED, DECOMPOSING MUSSEL SHELLS
ORANGE DRY-CLEANING TAG # 6.745
WET BLACK ORGANIC SOIL WITH ROCKS, PEBBLES, SAND
WET YELLOW-GREEN SAND, PEBBLES
FISH BONES
WOOD
SAND, PEBBLES
EXCAVATION LIMITS
ID1
ID2/2D1
ID3/2D2
ID4/2D3
ID5/2D4
ID6/2D5
ID7/2D6
ID8/2D7
ID9/2D8
ID10/2D9
ID11/2D10
ID12/2D11
ID13/2D12
ID14/2D13
ID15/2D14
ID16/2D15
ID17/2D16
ID18/2D17
ID19/2D18
2D19
2D20
2D21
2D22
2D23
2D24
IE1/2E1
IE2/2E2
IE3/2E3
IE4/2E4
IE5/2E5
IE6/2E6
IE7/2E7
IE8/2E8
IE9/2E9
IE10/2E10
IE11/2E11
IE12/2E12
IE13/2E13
IE16/2E16
IE17/2E17
IF1/2F1
IF2/2F2
IF3/2F3
IF4/2F4
IF5/2F5
IF6/2F6
IF7/2F7
IF8/2F8
IF9/2F9
IF10/2F10
IF11/2F11
IF12/2F12
IF13/2F13
IF14/2F14
IF15/2F15
IF16/2F16
IF17/2F17
IF18/2F18
2F19
2F20
2F21
2F22
2F23
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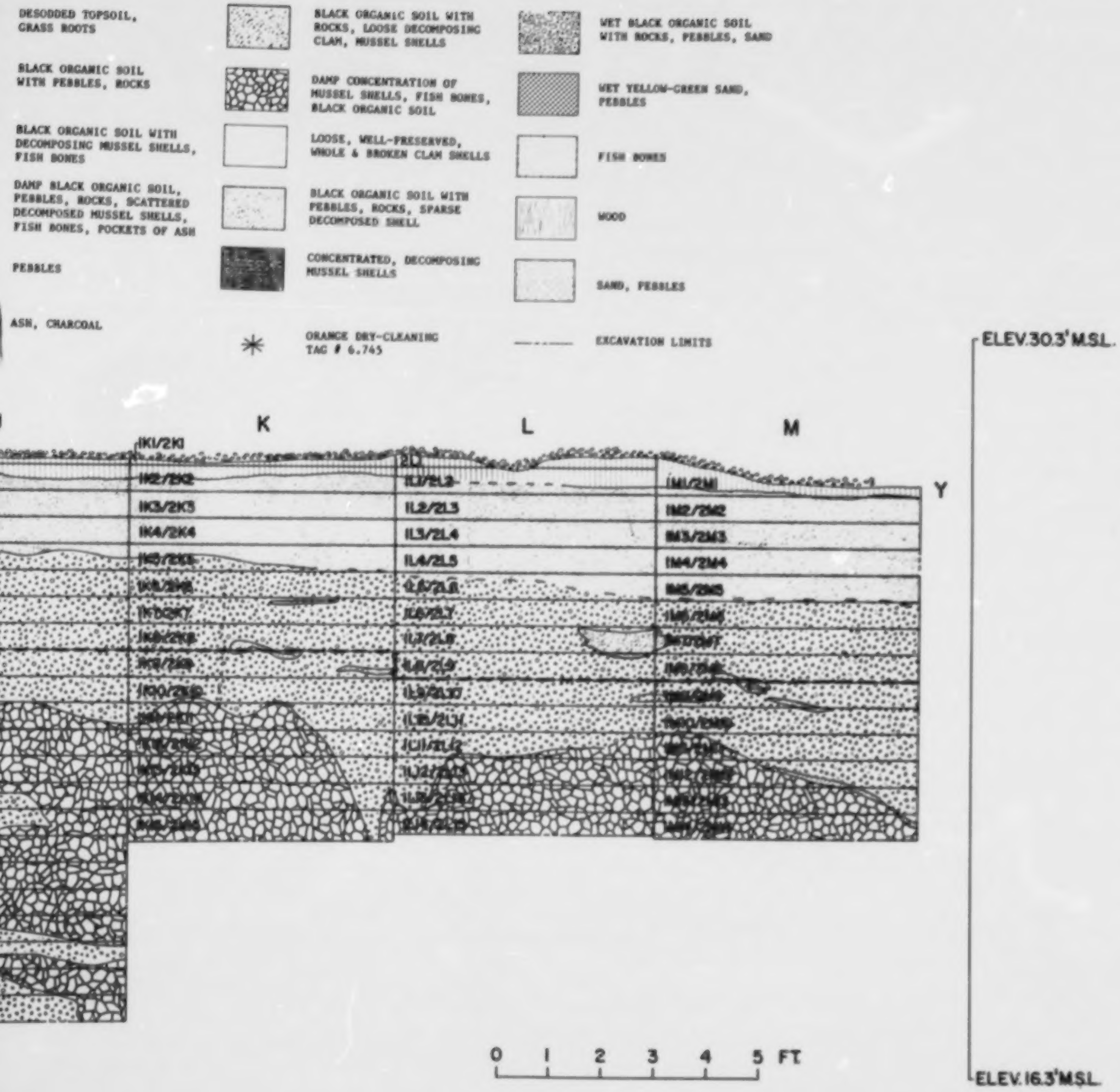
IG2/2G1
IG3/2G2
IG4/2G3
IG5/2G4
IG6/2G5
IG7/2G6
IG8/2G7
IG9/2G8
IG10/2G9
IG11/2G10
IG12/2G11
IG13/2G12
IG14/2G13
IG20/2G19
IG21/2G20
IG22/2G21
IG23/2G22
IH1
IH2/2H1
IH3/2H2
IH4/2H3
IH5/2H4
IH6/2H5
IH7/2H6
IH8/2H7
IH9/2H8
IH10/2H9
IH11/2H10
IH12/2H11
IH13/2H12
IH14/2H13
IH15/2H14
IH16/2H15
IH17/2H16
IH18/2H17
IH19/2H18
IH20/2H19
2H24
IJ1/2J1
IJ2/2J2
IJ3/2J3
IJ4/2J4
IJ5/2J5
IJ6/2J6
IJ7/2J7
IK1/2K1
IK2/2K2
IK3/2K3
IK4/2K4
IK5/2K5
IK6/2K6
IK7/2K7
IK8/2K8
IK9/2K9
IK10/2K10
IL1
IL1/2L2
IL2/2L3
IL3/2L4
IL4/2L5
IL5/2L6
IL6/2L7
IL7/2L8
IL8/2L9
IL9/2L10
IL10/2L11
IL11/2L12
IL12/2L13
IM1/2M1
IM2/2M2
IM3/2M3
IM4/2M4
IM5/2M5
IM6/2M6
IM7/2M7
IM8/2M8
0 1 2 3 4 5 FT

FIG. 14


DESODDED TOPSOIL, GRASS ROOTS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS
BLACK ORGANIC SOIL WITH DECOMPOSING MUSSEL SHELLS, FISH BONES
DAMP BLACK ORGANIC SOIL, PEBBLES, ROCKS, SCATTERED DECOMPOSED MUSSEL SHELLS, FISH BONES, POCKETS OF ASH
PEBBLES
ASH, CHARCOAL
BLACK ORGANIC SOIL WITH ROCKS, LOOSE DECOMPOSING CLAM, MUSSEL SHELLS
DAMP CONCENTRATION OF MUSSEL SHELLS, FISH BONES, BLACK ORGANIC SOIL
LOOSE, WELL-PRESERVED, WHOLE & BROKEN CLAM SHELLS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS, SPARSE DECOMPOSED SHELL
CONCENTRATED, DECOMPOSING MUSSEL SHELLS
ORANGE DRY-CLEANING TAG # 6.745
WET BLACK ORGANIC SOIL WITH ROCKS, PEBBLES, SAND
WET YELLOW-GREEN SAND, PEBBLES
FISH BONES
WOOD
SAND, PEBBLES
EXCAVATION LIMITS
K
L
M
Y
1K1/2K1
1K2/2K2
1K3/2K3
1K4/2K4
1K5/2K5
2L1
1L1/2L2
1L2/2L3
1L3/2L4
1L4/2L5
1L5/2L6
1L6/2L7
1L7/2L8
1L8/2L9
1L9/2L10
1L10/2L11
1L11/2L12
1M1/2M1
1M2/2M2
1M3/2M3
1M4/2M4
1M5/2M5
1M6/2M6
ELEV. 30.3' M.S.L.
ELEV. 16.3' M.S.L.
0 1 2 3 4 5 FT

CORRELATION OF STRATIGRAPHY AND ARBITRARY LEVELS

PROFILE V-W

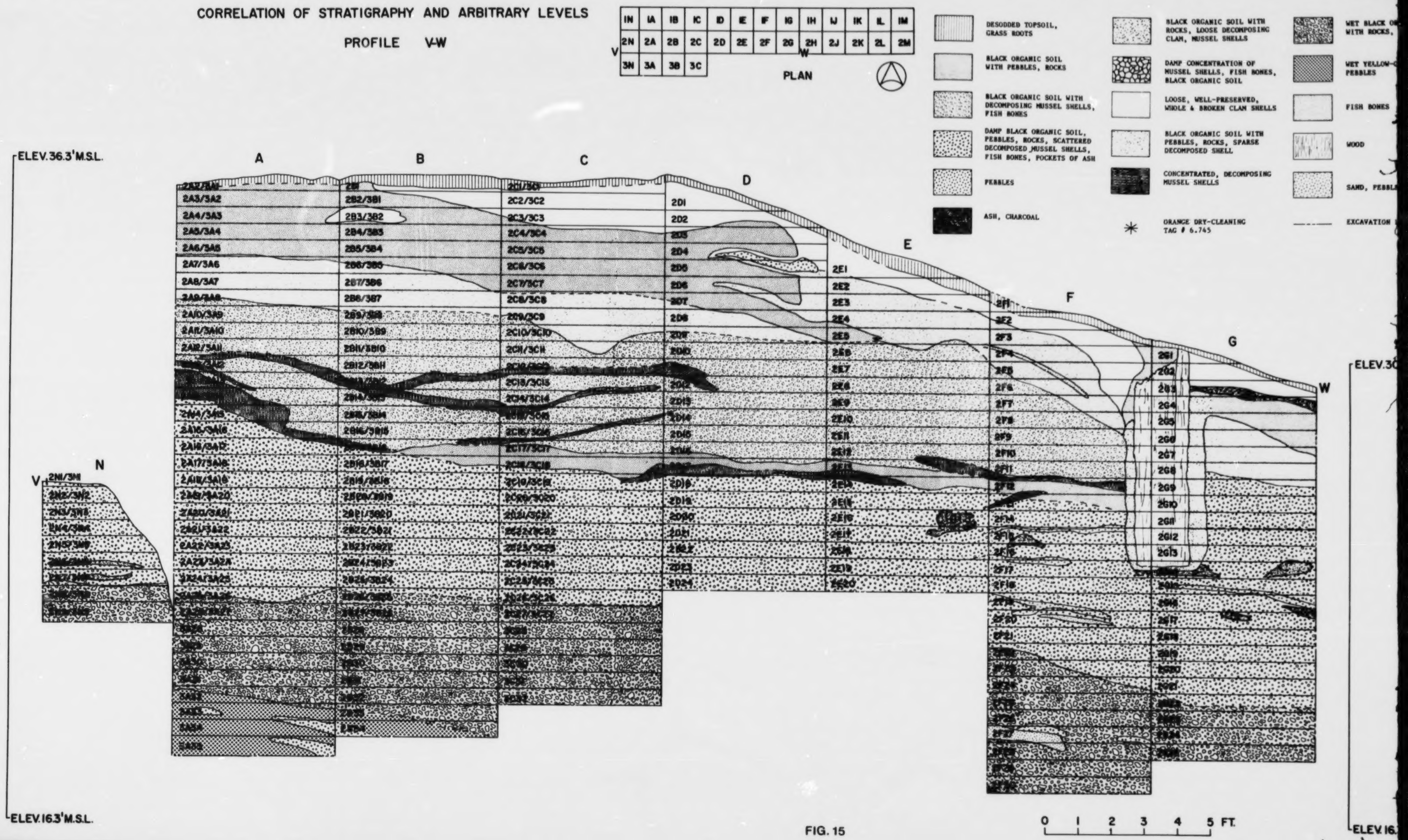
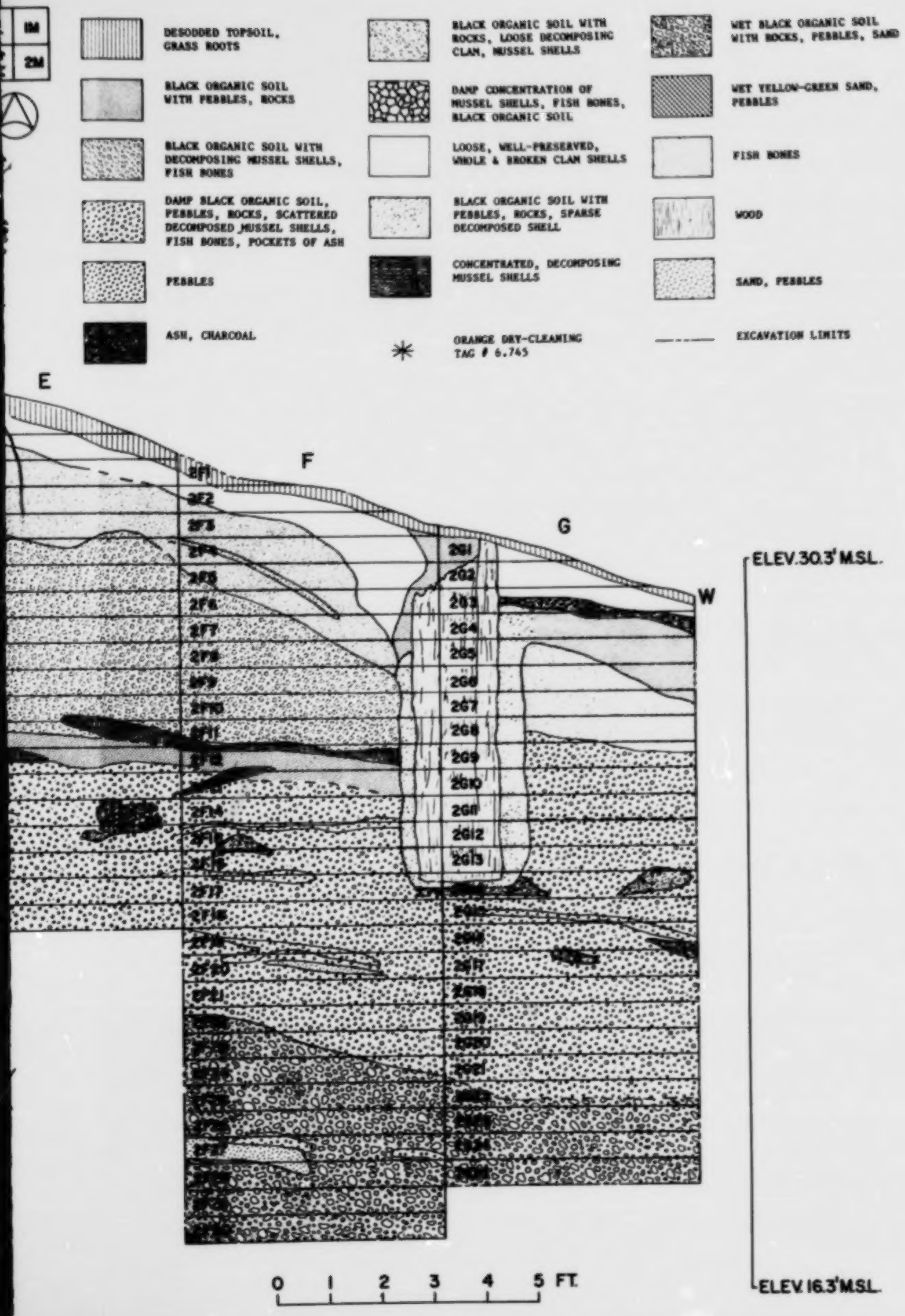

PLAN
1N 1A 1B 1C 1D 1E 1F 1G 1H 1J 1K 1L 1M
2N 2A 2B 2C 2D 2E 2F 2G 2H 2J 2K 2L 2M
3N 3A 3B 3C
V
W
DESODDED TOPSOIL, GRASS ROOTS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS
BLACK ORGANIC SOIL WITH DECOMPOSING MUSSEL SHELLS, FISH BONES
DAMP BLACK ORGANIC SOIL, PEBBLES, ROCKS, SCATTERED DECOMPOSED MUSSEL SHELLS, FISH BONES, POCKETS OF ASH
PEBBLES
ASH, CHARCOAL
BLACK ORGANIC SOIL WITH ROCKS, LOOSE DECOMPOSING CLAM, MUSSEL SHELLS
DAMP CONCENTRATION OF MUSSEL SHELLS, FISH BONES, BLACK ORGANIC SOIL
LOOSE, WELL-PRESERVED, WHOLE & BROKEN CLAM SHELLS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS, SPARSE DECOMPOSED SHELL
CONCENTRATED, DECOMPOSING MUSSEL SHELLS
ORANGE DRY-CLEANING TAG # 6.745
WET BLACK O
WITH ROCKS,
WET YELLOW-
PEBBLES
FISH BONES
WOOD
SAND, PEBBL
EXCAVATION
ELEV. 36.3' M.S.L.
ELEV. 16.3' M.S.L.
ELEV. 3
ELEV. 16.
A
B
C
D
E
F
G
N
V
W
0 1 2 3 4 5 FT.

FIG. 15


1M
2M
DESODDED TOPSOIL, GRASS ROOTS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS
BLACK ORGANIC SOIL WITH DECOMPOSING MUSSEL SHELLS, FISH BONES
DAMP BLACK ORGANIC SOIL, PEBBLES, ROCKS, SCATTERED DECOMPOSED MUSSEL SHELLS, FISH BONES, POCKETS OF ASH
PEBBLES
ASH, CHARCOAL
BLACK ORGANIC SOIL WITH ROCKS, LOOSE DECOMPOSING CLAM, MUSSEL SHELLS
DAMP CONCENTRATION OF MUSSEL SHELLS, FISH BONES, BLACK ORGANIC SOIL
LOOSE, WELL-PRESERVED, WHOLE & BROKEN CLAM SHELLS
BLACK ORGANIC SOIL WITH PEBBLES, ROCKS, SPARSE DECOMPOSED SHELL
CONCENTRATED, DECOMPOSING MUSSEL SHELLS
ORANGE DRY-CLEANING TAG # 6.745
WET BLACK ORGANIC SOIL WITH ROCKS, PEBBLES, SAND
WET YELLOW-GREEN SAND, PEBBLES
FISH BONES
WOOD
SAND, PEBBLES
EXCAVATION LIMITS
E
F
G
W
2F1
2F2
2F3
2F4
2F5
2F6
2F7
2F8
2F9
2F10
2F11
2F12
2F14
2F15
2F16
2F17
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2G2
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2G5
2G6
2G7
2G8
2G9
2G10
2G11
2G12
2G13
2G15
2G16
2G17
2G18
2G19
2G20
2G21
ELEV. 30.3' M.S.L.
ELEV. 16.3' M.S.L.
0 1 2 3 4 5 FT.

The Sample

The excavations yielded approximately 90 cubic ft. of archaeological materials. All was processed and subjected to analysis. Control of the sample during washing, numbering and sorting was maintained with the aid of laundry drycleaning tags (Aish et al. 1968). Artifacts recorded three-dimensionally were bagged individually in the field and processed separately in the laboratory. After washing the contents of the level bags, which contained faunal remains and artifacts, as many artifacts that could be recognized were separated for processing and study. The sample was then sent to specialists who in turn removed their specimens for study. Faunal remains and artifacts missed in the first sorting, but later recognized, were exchanged among the specialists.

Faunal remains consisted approximately as follows:

fish	171,000	elements
molluscs	25,000	shells and fragments
barnacles	1,451	plates and fragments
birds	6,000	identified elements
mammals	40,000	identified elements
human	300	elements

Exact quantities and proveniences will be given in separate reports.

The artifacts, including a small number from San Miguel Island and many screened from the slumps, totalled approximately as follows:

indigenous	4,138	artifacts
ceramics	463	objects
glass	200	objects
beads	77	objects
smoking pipes	24	objects
metal and other	2,500	artifacts and fragments

Precise counts and proveniences of the artifacts will be given in the respective analyses of the above.

The above sample was excavated from a known limited activity area of the site and therefore does not represent the site as a whole. Nevertheless, the ethnographically known activity areas at Yuquot indicate the general cultural significance of the sample in relation to the site. The area excavated - the midden crest and adjacent beachward slope - supported permanent habitations occupied by large corporate households. This area of the midden was formed of debris from activities within houses, activities near to or just outside houses and dumping outside the houses. Much of the archaeological sample therefore represents some or all of the activities known to have been associated with habitations: butchering of small animals and portions of large animals; cooking; storage of preserved fish and plant materials; storage and repair of hunting and fishing equipment; manufacture of textiles, tools hunting and fishing gear; feasts, potlatches and ceremonialism. The archaeological sample therefore likely reflects most activities of Nootkan village life.

With the beachward activity zone unsampled, however, we lack cultural remains from this other important activity zone of the village. The top of the midden bank next to the beach supported plank platforms. The bank itself was used for gardens in the historic period, for fish drying racks, and as a dump area for refuse. Small temporary plank houses occupied by visitors or small groups during village relocation were set against the bank. Smokehouses were sometimes set up on or near the bank. The beach area between the bank and the high tide line was used for heavy woodworking of canoes and planks. Whales and other large sea mammals were butchered there. The beachward activity zone contains items lost or discarded between the beach and the habitations. Limited ceremonialism also took place in the beachward zone.

Provenience Numbering System

Organization and analysis of the archaeological sample were facilitated by the provenience numbering system used by the National Historic Parks and Sites Branch (Swannack 1973). This numbering system indicates provenience by site and excavation control units. These are marked on the profile drawings and plan diagrams of the Yuquot excavation (Figs. 14, 15). Because Yuquot may be considered a type site for the Nootka culture area, the catalogue numbers of most artifacts recovered are given in this report in case the reader should wish to locate on the excavation profiles the approximate provenience of any artifact and faunal remains. The numbering system, as applied at Yuquot, indicates provenience as in the following example, 1T2A13B-1234x:

1T - Yuquot, British Columbia
2A - horizontal 5 ft. by 5 ft. grid square
13 - the thirteenth 0.5 ft. level below the ground surface of the grid square
B - a defined stratigraphic unit within 2A13. These letters (A, B, C, etc.) differentiate units excavated separately within a given level of a grid square.
1234 - an arbitrary number assigned only to the artifacts. The number alone indicates that the artifact provenience was recorded three-dimensionally in the field. The number followed by an "x" indicates that the artifact was recovered from the screen, and has a more approximate provenience limited to the grid square, arbitrary level and stratigraphic unit within the level.
x - the artifact was recovered in the screens.

Material collected on the ground surface after desodding was assigned the general provenience number 1T1X2. Material from slumps, wall scrapings and other lost or undefineable proveniences was labelled 1T1X1. In some instances, usually wall scrapings, material was recovered from a known grid square, but the level below ground surface could not be determined. Such artifacts were simply labelled without indicating the level, for example, 1T2C-2345x.

The small artifact sample recovered from the site of the Spanish gun battery on San Miguel Island was also assigned the Yuquot site designation of 1T, but is differentiated from the village excavation by the letters used for grid squares: P, Q, R, S, T, U, V. Surface artifacts from San Miguel were labelled 1T2X2; those from backdirt, 1T2X1. All the artifacts from San Miguel are of European or Euro-Canadian origin, and are discussed in the analyses of non-indigenous artifacts.

Stratigraphic Contexts, Radiocarbon Dating and Features

The excavation revealed well-stratified midden deposits (Figs. 11-15). Strata were differentiated according to one or more criteria: soil matrices, wetness or dryness, looseness and compactness, faunal remains and presence or absence of European artifacts. The homogeneous nature of the midden soil often made it difficult to determine precisely where one stratum ended and another similar, nonetheless different, stratum began: as for example, where black organic soil, pebbles and rocks merge into black organic soil, pebbles, rocks and sparse decomposed shell. In other situations, exact divisions between strata were relatively easy to determine: for example, between damp black organic soil, small pebbles, rocks, scattered decomposed mussel shells, fish bones and pockets of ash; and damp concentrations of mussel shells, fish bones and black organic soil. The descriptions of strata, as in the above examples, list the stratigraphic composition in order of relative abundance of materials.

The exposed stratification contains four major zones that extend throughout the excavation (Figs. 16, 17). Each zone comprises strata that do not extend throughout the excavation. Such strata are thought to have formed from minor processes and events, whereas the zones probably result from major cultural and environmental processes. The zones are numbered, from lowest and earliest to highest and most recent, as I to IV. The zones delineated on east-west profiles of the excavation (Figs. 16, 17) are also consistent for north-south sections which cut across the profiles, except for the Zone III-IV interface on the crest of the midden where strata dip slightly toward the south. The four zones have been dated by radiocarbon tests on charcoal samples from specific strata and features (Tables 1, 2, 5; Fig. 18).

The 28 radiocarbon determinations were compared mainly according to the procedure recommended by Polach and Golson (1966: 15-23). The reported radiocarbon ages based on the Libby half-life of 5570 years were adjusted by an increase of 3 per cent to approximate the accepted

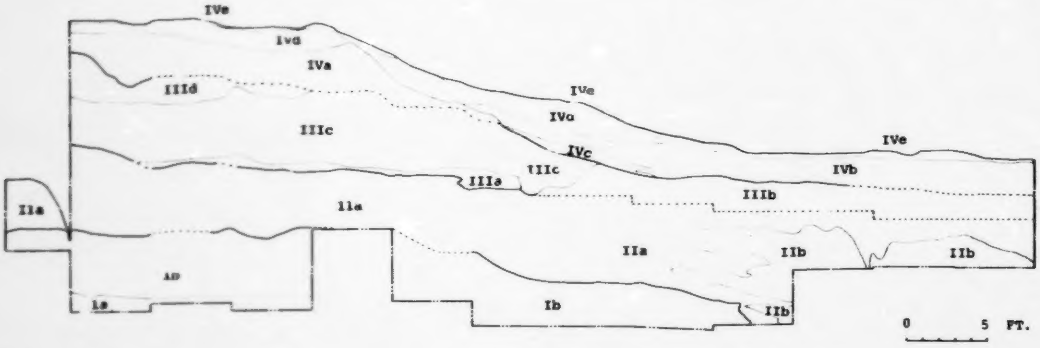


Figure 16. Stratigraphic zones and substrata in relation to profile X-Y.

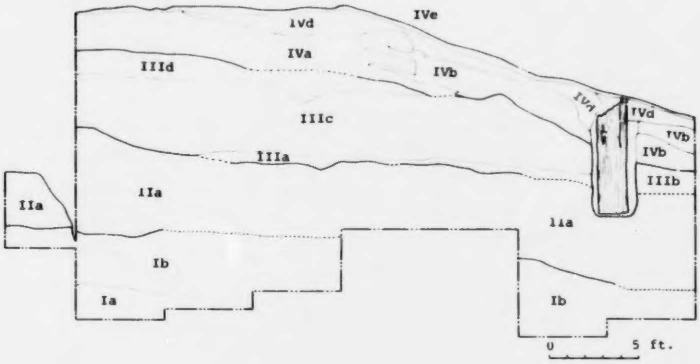


Figure 17. Stratigraphic zones and substrata in relation to profile V-W.

best value of the half-life of carbon-14, 5730 ± 40 years. For initial comparison, the radiocarbon ages were grouped according to zone, stratum and closest proximity, and the first and second standard error ranges of each age were plotted on a Christian calendar scale (Fig. 19). This made groups of similar ages from a given sratigraphic zone visually apparent. Apparent groups of similar ages from the same stratigraphic zone were then compared by means of the chi-square test (Kumar 1973) to determine whether or not the ages as a group were significantly different. When ages within a group were found to be significantly different, the suspected deviant age was removed, and the test was repeated until sets of not significantly different, or more or less contemporaneous, ages were isolated. Contemporaneous ages from related contexts within a stratigraphic zone were then averaged to imply approximate time periods for particular zones. Ages found to be significantly different from others in a given stratigraphic zone have been discarded from analysis. Whenever possible, attempts have been made to account for these deviant ages, but in most instances this could not be done. A laboratory check for possible environmental factors that might have affected the deviant ages, or even all the Yuquot radiocarbon results, was made by testing the branch of a wild cherry tree growing on

Table 1. Radiocarbon Samples and Derivations for Zone I

Sample	Wt (g)	Depth Below Datum Elevation 36.3 ft. MSL	Matrix and Associated Features	Stratum	Lab. Code	Reported Age (5570 Half-Life)	Adjusted Age (5730 Half-Life)
1T1A31#2	2500.00 plus	15.40-15.60	Sandy, wet black organic soil marbled with layers of sand and pebbles.	Ib	GaK-2179	4080±80	4202±100
1T1A36	11.50	17.55	Wet yellow-green sand and pebbles, with very little shell and some scattered bone.	Ia	GaK-2180	3000±100	3090±100
	1.35	"	"	"	GSC-1767	3590±190	3698±190
1T3A34#1	45.60	17.50	Wet yellow-green sand and pebbles.	Ia	GaK-2183	4230±90	4357±100

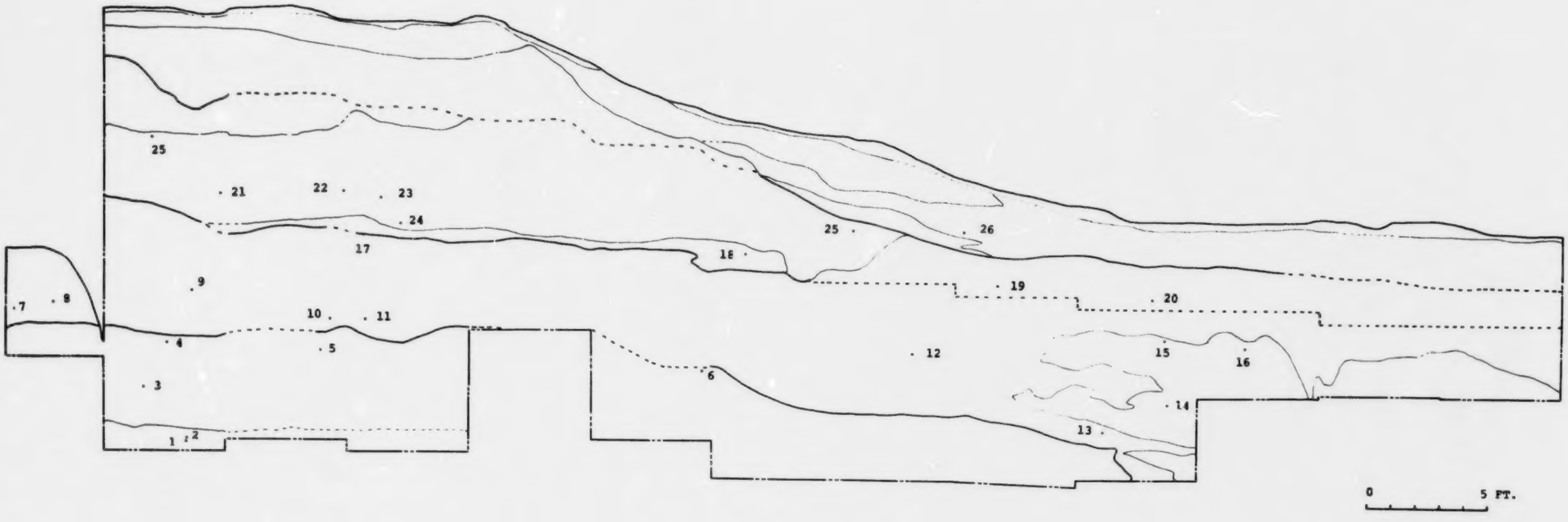


Figure 18. Proveniences of radiocarbon samples, with laboratory numbers and adjusted age determinations, in relation to profile X-Y.

Provenience	Sample No.	Lab Code	Adjusted Age B.P.	Provenience	Sample No.	Lab Code	Adjusted Age B.P.
1	1T1A36	GaK-2180	3090±100	14	1T1J16#1	GaK-2195	1823±100
		GSC-1767	3698±190	15	1T2J11A#2	GaK-2198	2160±100
2	1T3A34#1	GaK-2183	4357±100	16	1T2K12B#1	GaK-2199	1936±110
3	1T1A31#2	GaK-2179	4202±100	17	1T1C18A	GaK-2187	3420±100
4	1T1A28#2	GaK-2178	2112±90	18	1T2F12C#1	GaK-2192	1185±100
5	1T3B26A#1	GaK-2186	2184±110	19	1T1H10#1	GaK-2194	1082±100
6	1T1E24#1	GaK-2191	3111±220	20	1T2J8#2	GaK-2197	1287±100
7	1T3N6D#1	GaK-2201	2101±100	21	1T2A13A	GaK-2181	1586±110
8	1T2N5B#2	GaK-2200	1916±100	22	1T3B13	GaK-2184	1153±100
9	1T2A21	GaK-2182	1906±100	23	1T3C15	GaK-2189	1339±100
10	1T3B24B#1	GaK-2185	1318±100	24	1T3C17B#2	GaK-2190	1082±100
11	1T2C25#1	GaK-2188	3193±120	25	1T1G8A#1	GaK-2855	1009±150
12	1T2G17B#1	GaK-2193	2060±100	26	1T2H4#2	GaK-2852	1370±100
13	1T1J19A#2	GaK-2196	2709±110				

Table 2. Radiocarbon Samples and Derivations for Zone II

Sample	Wt (g)	Depth Below Datum Elevation 36.3 ft. MSL	Matrix and Associated Features	Stratum	Lab. Code	Reported Age (5570 Half-Life)	Adjusted Age (5730 Half-Life)
1T2N5B#2	13.20	12.00	Fine black organic soil, decomposed shell and bone.	IIa	GaK-2200	1860±90	1916±100
1T3N6D#1	20.06	12.42	Heavy, wet black organic soil, ash and some finely broken shell. Taken from inside fireplace 3N6/7.	IIa	GaK-2201	2040±90	2101±100
1T1A28#2	27.20	13.62	Heavy, wet black organic soil and small quantities of bone. Taken from ash deposit extending from level 1A27 into 1A28.	IIa	GaK-2178	2050±90	2112±90
1T2A21	124.90	16.30	Wet, black organic soil, decomposed shell and rocks.	IIa	GaK-2182	1850±90	1906±100
1T3B24B#1	11.10	12.51	Wet black organic soil, pebbles, ash and stones.	IIa	GaK-2185	1280±90	1318±100
1T3B26A#1	22.6	13.82	Wet black organic soil, pebbles, traces of ash. Taken 0.8 ft. from rockpile in 3B26.	IIa	GaK-2186	2120±110	2184±110
1T1C18A	16.30	9.15	Decomposing shells and fish bones in black organic soil.	IIa	GaK-2187	3320±90	3420±100
1T2C25#1	44.30	12.56	Wet black organic soil, pebbles and stones.	IIa	GaK-2188	3100±120	3193±120
1T1E24#1	7.00	14.65	Wet black organic soil, ash, rocks. Taken from bottom of fireplace 1E23/24.	IIa	GaK-2191	3020±220	3111±220
1T2G17B#1	9.30	13.80-13.90	Wet ash. From inside fireplace 2G17 North.	IIa	GaK-2193	2000±80	2060±100
1T1J16#1	30.70	15.90	Black organic soil, ash and decomposed shell.	IIb	GaK-2195	1770±90	1823±100
1T1J19A#2	25.20	17.09	Heavy damp black organic soil, rocks, decomposed bone.	IIa	GaK-2196	2630±110	2709±110
1T2J11A#2	18.40	13.26	Black organic soil, rocks, pebbles, fish bones and shell.	IIa	GaK-2198	2160±100	2225±100
1T2K12B#1	18.30	13.25	Black organic soil, shell and some decomposed bone.	IIa	GaK-2199	1880±110	1936±110

the site. The branch showed an activity of 164 per cent modern (GaK-2853), which corresponds to a tree ring sample grown between 1964 and 1967 (K. Kigoshi, personal communication). No adverse environmental factors were apparent in the Yuquot dating.

The four stratigraphic zones span some 4300 years, during which changes in sea level and climate occurred. Before discussing the strata and significance of each zone, it will be useful to outline the post-glacial environmental changes that probably affect the stratigraphic sequence. Few postglacial and biotic studies have been made of the Nootka Sound region. Therefore, studies available for adjacent or related regions are utilized when it appears likely that their findings also apply to the west coast of Vancouver Island.

Late Pleistocene and Post-Glacial Events

Southwestern British Columbia experienced the Fraser Glaciation from about 26,000 to 13,000 years ago. Geologists have traditionally viewed the Fraser Glaciation - particularly its late development, the Vashon Stade - as a mountain glaciation (Armstrong et al. 1965; Mathews et al. 1970). It was believed that a more or less continuous ice sheet stretched from the Coast Mountains, across Georgia Strait, over

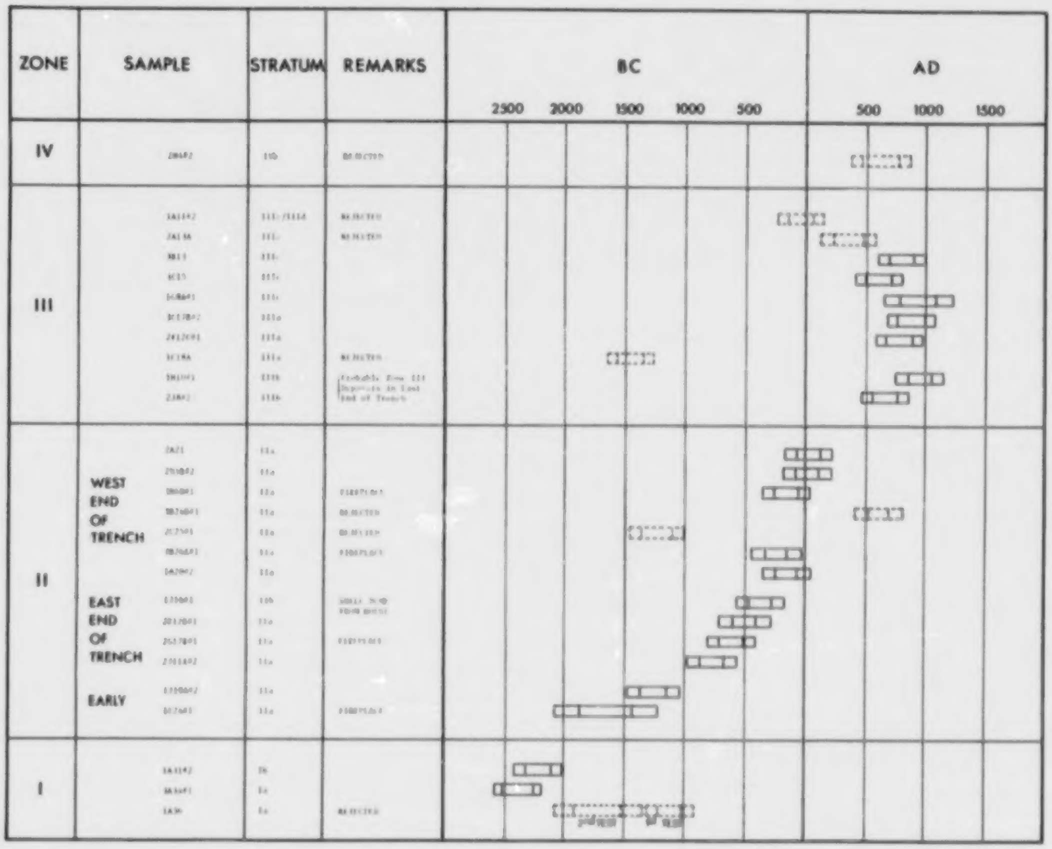


Figure 19. Adjusted radiocarbon ages correlated with stratigraphic zones and the Christian calendar.

Vancouver Island and out to sea for some distance. Only the highest mountains, seaward ridges and headlands were thought to have remained unglaciated. Such conditions would have prevented human occupation.

Recent examination of data on the Fraser Glaciation (Fladmark 1975: 100-142; Muller 1979; personal communication), however, strongly suggests a different situation. The mountain type glaciation is thought to be a pre-Fraser phenomenon. Increasing evidence indicated that the Fraser glaciation was less severe and less extensive than previously supposed. Many areas of the coast were ice free, and open to human occupation. During the Fraser Glaciation, the Vancouver Island Mountains were covered by local ice caps from which valley glaciers issued; Nootka Island and Nootka Sound were ice-free (Muller 1979).

About 13,000 B.P. deglaciation occurred, and by 12,000 B.P. the land had rebounded isostatically for several hundred feet (Mathews et al. 1970: 691). The lowland on the south coast of Nootka Island, where Yuquot is situated, may have emerged as part of the isostatic rebound. About 11,000 B.P. a glacial readvance known as the Sumas Stade directly affected the Fraser Lowland and the Strait of Georgia. The influence of the Sumas Stade on the west coast of Vancouver Island is not known, but was probably minimal. Fladmark reviews the evidence for the Sumas

Stade and concudes that it is "best interpreted as a localized glacial re-advance into the Fraser valley dating sometime between 11,500 and 10,000 B.P." (1975: 115-118). By 9500 B.P. the Sumas ice had left the Fraser Lowland (Mathews et al. 1970: 692, 696). The climate of this early post-glacial period of 10,500 to 8500 B.P. was cool and moist, similar to that of today, but the principal forest vegetation was lodgepole pine with alder (Heusser 1960: 179, 183).

Between 8500 B.P. and 3000 B.P., a Hypsithermal occurred in which the mean annual temperatures exceeded those of today. This warmer climate underwent long fluctuations in both temperature and rainfall and consequently affected vegetation succession (see Heusser 1960: 184-86). In the most recent Hypsithermal fluctuation, ca. 5500 B.P. to 3000 B.P., which is partly contemporary with stratigraphic Zone I at Yuquot (Fig. 20), the climate was cooler than earlier in the Hypsithermal, but more humid; predominant forest vegetation was Douglas fir, western hemlock, alder and Lysichitum (Heusser 1960: 179, 184-85).

During the Hypsithermal, sea level rose, but there is considerable unresolved controversy about how high or low it fluctuated, and whether or not sea level exceeded its present level during post-glacial times (see Jelgersma 1966). Fairbridge maintains that post-glacial sea level fluctuated considerably and for periods even exceeded present day sea level (Fairbridge 1958: 1960; 1961). Other research suggests a rapid eustatic rise in sea level until 3600 B.P. when a standstill was reached (Coleman and Smith 1964). Recent studies favour a continually rising sea level (Shepard and Suess 1956; Shepard 1964; Shepard and Curray 1967; Shepard et al. 1967; Redfield 1967; Curray et al. 1970).

How applicable to southwestern British Columbia are these general models of sea level changes? A major problem in establishing accurate curves of former sea levels is distinguishing truly eustatic changes from isostatic or combined isostatic-eustatic-tectonic changes. Levels established for glaciated mountainous shorelines are always suspect because of isostatic rebound and tectonic movements. Although isostatic rebound in southwestern British Columbia was considerable, it was essentially complete by 8000 B.P., and subsequent sea level changes there were primarily eustatic (Mathews et al. 1970: 693). Therefore, models of sea level change after 8000 B.P. likely apply generally to southwestern British Columbia.

Although the Fairbridge model has received considerable criticism from supporters of the continually rising sea level model, the Fairbridge model has not been completely refuted. It has found support from archaeological research on Long Island Sound (Salwen 1962) and the Gulf of Mexico (Holmes and Trickey 1974). The Fairbridge model may apply broadly or in modified form to southwestern British Columbia. In discussing this problem, Mitchell finds support from Heusser (1960: 190, 194) for Fairbridge's Older and Younger Peron Highs, and notes possible evidence of yet undated elevated and partly submerged shell middens for a fluctuating post-glacial sea level (Mitchell 1971: 65-67). Stratigraphic Zone I at Yuquot appears to have been subjected to wave action 4000 years ago, but is now some 17 ft. above mean sea level. Such transgressions and apparent lowerings of sea level are probably the result of localized tectonic movements (J. Muller personal communication; J. Clague personal communication). The British Columbia coastline, particularly off Vancouver Island, is well known for its tectonism (Mathews et al. 1970; Clague 1975; Muller 1977, 1979). The Yuquot case, at least, may have also partly resulted from rapid eustatic oscillations occurring within short time periods (J. Clague personal communication). Clearly, more data is required for all areas of the coast, and the models outlined here will become greatly refined through future research.

The model of a continually rising sea level diminishing in the last several millenia appears more appropriate for southwestern British Columbia. General sea level curves based on eustatic, isostatic and tectonic factors have now been established for the southern inner coast (Mathews et al. 1970; Fladmark 1975: 145-49; Clague 1975). Such curves have not yet been determined for the west coast of Vancouver Island; presumably the southern coastal curves for the less glaciated or non-glaciated areas would apply there generally. The southern coastal curves indicate that the period from 10,000 B.P. to 6000 B.P. was characterized by relatively low sea level, in some places as much as 35 ft. below the present shoreline. During the past 5500 years, sea level has remained close to the present level. It should be kept in mind, however, that tectonism may affect local land-sea relationships.

At 3000 B.P. the Hypsithermal closed and the Late Post-glacial began. Its colder, more humid climate like that of today favoured western hemlock and Sitka spruce as the predominant forest trees, but fir, mountain hemlock, lodgepole pine, western white pine, heaths and Sphagnum were also important (Heusser 1960: 179, 186-89). The present climate and vegetation at Nootka Sound are well outlined in Krajina's biogeoclimatic zone, "coastal western hemlock" (Krajina 1965).

Zone I

Zone I contains two major strata (Figs. 16, 17). Both contained considerable amounts of ground water, which increased with depth of excavation. Preservation of organic remains was poor compared to overlying strata.

The deepest stratum below the ground surface was found in the west end of the trench. It contains wet, yellow-green pebbles and sand, with few faunal remains and artifacts (Ia). The bottom of this stratum was not reached, however. A test hole dug 2 ft. below grid square/level 2B34 revealed the deposit still present, with fish vertebrae among the sand and pebbles. Thus, definite culturally sterile deposits were not encountered, and the depth of cultural deposits at Yuquot is not conclusively known.

Overlying stratum Ia, and extending over most of the bottom of the excavation trench, is the major stratum of Zone I: wet black organic soil with rocks, pebbles and sand: pebble lenses and occasional bits of charcoal also occur (Ib). Concentrations of fish bone and lenses of mussel shell were occasionally encountered. Although stratum Ib contained more faunal remains than stratum Ia, there were relatively few faunal remains compared to the overlying three stratigraphic zones.

Many faunal remains and artifacts from both strata in Zone I are waterworn.

Three carbon samples from Zone I were dated (Table 1; Figs. 18, 19). Samples 1T1A31#2 from stratum Ib and 1T3A34#1 from stratum Ia (Fig. 18) yielded adjusted radiocarbon dates of 4202±100 B.P. and 4357±100 B.P., respectively. The chi-square test showed these dates to be not significantly different. They average 4280 radiocarbon years B.P. or 2330 B.C.

Sample 1T1A36 from stratum Ia (Fig. 18) yielded an adjusted radiocarbon date of 3090±100 B.P. This, compared to the other Zone I dates, is clearly deviant. As a check, the remainder of sample 1T1A36 was dated, giving an adjusted radiocarbon date of 3698±190 B.P. Although this result approaches the other Zone I dates, the chi-square test shows it to be significantly different from them. If the remaining sample had been larger, perhaps the result would have approximated the other Zone I dates.

The excavated Zone I strata cover a time period of 2300 B.C. to ca. 1000 B.C. The earlier date is based on the average of the two adjusted determinations shown to be significantly not different. One should bear in mind, however, that the earlier date applies to the excavated strata. Cultural deposits go deeper than excavation limits, so the first human occupation of Yuquot likely predates 2300 B.C. The later date of ca. 1000 B.C. is the average of adjusted determinations from samples 1T1E24#1 and 1T1J19A#2, which are discussed under Zone II.

Waterworn artifacts and faunal remains and relatively few organic materials in Zone I indicate that the strata there were partly or wholly submerged at times. This situation has nothing to do with recent or present sea levels because the lowest Zone I deposits excavated are from 17.3 to 18.5 ft. above present mean sea level. The time span of Zone I correlates well with that of Fairbridge's Younger Peron High (Fig. 20) and a 15-ft. high transgression reported for Hope Island by Heusser (1960: 194). Sea levels were also higher on the Queen Charlotte Islands at this time (Clague 1975: 18). Little is known yet of late Quaternary land-sea level relationships on the west coast of Vancouver Island. Perhaps a sea level curve similar to that for the Queen Charlotte Islands will eventually be developed. The waterworn deposits now above present sea level may be the result of tectonic movements, rapid eustatic oscillations or combined eustatic-tectonic factors.

The excavated waterworn deposits were the higher areas of the site during formation of Zone I. If the sea level in the Younger Peron High rose about 10 ft. above present mean sea level, Yuquot would have been a low-lying sand and gravel spit with a maximum elevation of about 9 ft. above sea level. The paucity of black organic soil in the Zone I deposits, particularly in the lower levels, suggests that vegetation was sparse. The low elevation, waterworn artifacts and faunal remains and probable sparse vegetation suggest that the site suffered occasional flooding from uncommonly high tides and severe winter storms. This would have made the site unsuitable for prolonged occupation or winter occupation. During formation of Zone I, the site was possibly used as a fishing station or camp in the warmer summer months.

If in late Zone I the sea level had dropped toward present day sea level or even to a few feet below it as suggested by the Crane Key Low

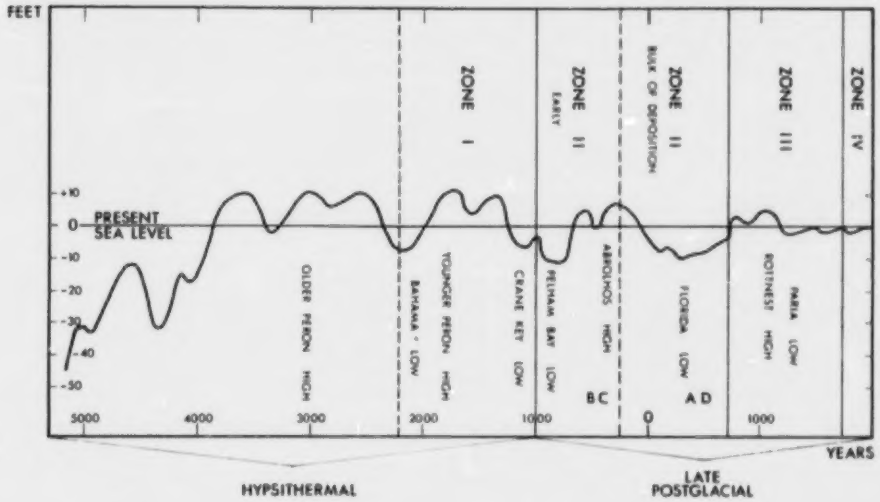


Figure 20. Post-glacial sea level curve (after Fairbridge in Salwen 1962: 47 and in Mitchell 1971: 66) correlated with climatic change (Heusser 1960) and stratigraphic zones at Yuquot.

(Fig. 20), the spit would have gained from 10 to 15 ft. in elevation. Such a rise in elevation may have resulted moreso from tectonic movements than actual eustatic changes. In either case, the increased emergence of land above the sea would have made the site more suitable for prolonged or intensive human occupation. The upper levels of Zone I contain relatively more black organic material and faunal remains than the lower levels. This suggests that more vegetation was developing on the site and/or that the site was being used more intensively or for longer periods, but possibly still as a fishing station or campsite.

Zone II

The Zone II deposits contain extensive organic materials and remains of rock-rimmed firepits and associated features. Most of the excavated Zone II deposits likely formed from activities within a large household. The superimposition and clustering of firepits over time suggest that the house, or its frame, was relatively permanent.

Zone II contains two major strata (Figs. 16, 17). The major stratum is damp black organic soil, small pebbles, rocks, scattered decomposed mussel shells, fish bones and pockets of ash (IIa). Small pebble lenses are frequently associated with the abundant concentrations of ash and charcoal. Eighteen rock-rimmed firepits, several superimposed, were uncovered. Many small holes were associated directly with the firepits and ash concentrations.

The well-defined positions of firepits, abundant pockets of ash and charcoal, small holes and relatively sparse mollusc remains indicate that stratum IIa probably built up from activities within or about a large dwelling occupied intermittently for many years. The concentrations of ash and charcoal were likely produced by small fires and from scattering the remains of large firepits.

The second stratum, located in grid squares H-M (Fig. 16), is a damp concentration of mussel shells, fish bones and black organic soil (IIb). The lower deposits of this concentration were extremely hard, reddish-brown and cemented. The reddish-brown colour suggests that ground water containing iron compounds leached calcium carbonate from the shells; it then cemented together the midden refuse. This process has been reported for similar material in old California shell middens (Meighan 1959: 388). The cemented Yuquot shells, bones and pebbles could not be separated as intact units by either physical or chemical means. Stratum IIb lies on a beachward slope east of the firepit concentrations. The abundant shells and fishbones which characterize stratum IIb are likely refuse dumped or thrown beachward from the nearby inferred household area of firepit concentrations.

Two dates based on charcoal samples from the lowest levels of stratum IIa in the east half of the trench (Table 2; Figs. 18, 19) show that Zone II began to form at 1000 B.C. Sample 1T1J19A#2 came from below the heavy shell deposits of stratum IIb, which indicates that the sample was deposited before the formation of stratum IIb. This sample yielded an adjusted determination of 2709±110 B.P., or 759 B.C. The other sample, 1T1E24#1, was directly associated with a rock-rimmed firepit on the interface of strata Ib and IIa. This sample has been assigned to stratum IIa, because all the firepits occur there. Sample 1T1E24#1 gave an adjusted radiocarbon date of 3111±220 B.P. The dates from both samples were found to be not significantly different. The dates average 2910 radiocarbon years, or 960 B.C.; hence, ca. 1000 B.C.

In contrast to this date, eight dated charcoal samples from the lower to middle levels of stratum IIa and one from the lower levels of stratum IIb (Table 2; Fig. 19) show that the bulk of Zone II deposits formed after 200 B.C. Three of these samples (1T3N6D#1, 1T3B26A#1, 1T2G17B#1), each directly associated with a rock-rimmed firepit, yielded three radiocarbon dates (adjusted ages of 2101±100, 2184±110, 2060±100, respectively) which the chi-square test found to be not significantly different. They average 2115 radiocarbon years B.P. or 165 B.C. Five radiocarbon dates from charcoal samples from the mid- to lowest levels of stratum IIa (Table 2; Fig. 19) in the west half of the trench were shown by the chi-square test to be not significantly different:

Sample No.	Adjusted C^{14} Years B.P.
1T1A28#2	2112±100
1T2N5B#2	1916±100
1T3N6D#1	2101±100
1T2A21	1906±100
1T3B26A#1	2184±110

These not significantly different adjusted dates average 2044 radiocarbon years B.P. or 94 B.C.

Four radiocarbon dates from charcoal samples from the middle levels of strata IIa and IIb in the east half of the trench (Table 2; Fig. 19) were found to be not significantly different:

Sample No.	Adjusted C^{14} Years B.P.
1T2G17B#1	2060±100
1T1J16#1	1823±100
1T2J11A#2	2225±100
1T2K12B#1	1936±110

These dates average 2011 radiocarbon years B.P. or 61 B.C., which ties in nicely with the average of the five not significantly different adjusted dates for the west end of the trench. A chi-square test on all nine dates as a group showed them to be not significantly different. These nine adjusted dates average 2029 radiocarbon years B.P. or 79 B.C.

Three carbon samples from the western end of the trench (Fig. 19) yielded radiocarbon dates significantly different from the above discussed results:

Sample No.	Adjusted C^{14}Years B.P.
1T3B24B#1	1318±100
1T1C18A	3420±100
1T2C25#1	3193±120

These deviant results cannot be accounted for.

Eighteen rock-rimmed firepits were found in Zone II. Specific data on each one are given in Table 3, and stratigraphic positions in Fig. 21. Most firepits were similar in shape, size, construction and associations.

The largest firepit, 3A22/23, had outer dimensions of 4.7 by 4.2 ft., and inner dimensions of 2.5 by 1.3 ft. (Fig. 22). The smallest firepit, 1G18 North, measured 1.3 ft. by 1.2 ft. on the outside, and 0.8 by 0.7 ft. on the inside. Ten firepits had outer dimensions ranging from 2.0 to 2.7 ft.; five from 1.3 to 1.8 ft.; two from 3.0 to 3.6 ft.; and one from 4.2 to 4.7 ft. The inner dimensions, however, are more consistent. Three were less than 1.0 ft. in diameter; thirteen ranged from 1.0 to 1.9 ft.; and two had maximum inner dimensions from 2.3 to 2.5 ft.

Fifteen firepits were circular or roughly circular in outline and three (1E23/24, 2F18, 3N6/7) were rectangular. Most were built of five to ten large smooth or fractured beach stones, in between which smaller stones were added. The bottom of each firepit was lined with pebbles or small beach stones. The firepits contained, in addition to ash and charcoal, small fire-cracked and fire-blackened beach stones. These were heated, probably to be dropped into a water-filled box to boil water for cooking, as depicted in Webber's drawing of a house interior at Nootka Sound in 1778, and reported by Moziño (1970: 20), Drucker (1951: 62) and others. Piles of beach stones were found in close proximity to the firepits in at least 11 instances. These stones were presumably used for cooking, and for repairing or building firepits.

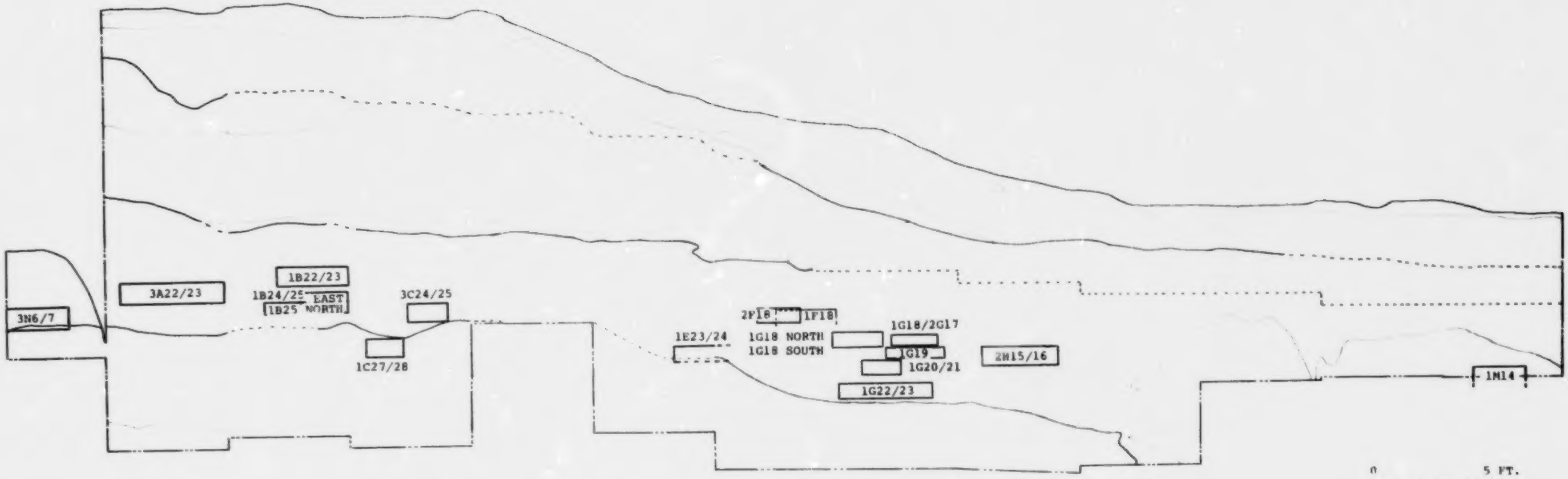

3N6/7
3A22/23
1B22/23
1B24/25 EAST
1B25 NORTH
3C24/25
1C27/28
1E23/24
2F18
1F18
1G18 NORTH
1G18 SOUTH
1G18/2G17
1G19
1G20/21
1G22/23
2H15/16
1M14
0
5 FT.

Figure 21. Schematic positions of firepits in relation to profile X-Y.

Table 3. Rock-Rimmed Firepits in Zone II

Firepit Level No.	Outer Dimensions (ft.)	Inner Dimensions (ft.)	Structural Details and Associations
3N6/7	2.3 x 2.1	1.6 x 1.4	Rectangular to square. 5 main stones: largest, 1.25 x 0.3 x 1.2; smallest, 0.65 x 0.3 x 0.4. Contained broken beach stones averaging 0.27 x 0.17 x 0.07, heavy ash and charcoal. Charcoal sample 1T3N6D#1 from inside firepit gives adjusted age of 2101±100 years.
3A22/23	4.7 x 4.2	2.5 x 1.3	Roughly circular. 9 large angular stones and a large whalebone (Fig. 22). Pebbles 0.2-0.3 diam. line bottom in 3A24/25. Largest firepit.
1B22/23	2.2 x 2.0 (approx.)	1.5 x 1.2 (approx.)	Roughly circular. 6 main stones: largest, 0.8 x 0.5 x 0.4; smallest, 0.4 x 0.25 x 0.35. Some stones possibly displaced in excavation. Beach stones 0.3 x 0.2 line bottom. Pile of stones 1.0 SW.
1B24/25 East	2.1 x 2.0	1.2 x 1.0	Roughly circular. 4 angular rocks and 2 large beach stones: largest, 1.05 x 0.5 x 0.5; smallest, 0.5 x 0.3 x 0.3. Bottom lined with beach stones 0.2-0.3 diam. Located 0.5 from firepit 1B25 North. Pile of stones 2.0 W. (Fig. 23).
1B25 North	2.6 diam.	1.9 diam.	Apparently roughly circular (only one-half could be excavated) (Fig. 23). Five main stones used to form half: largest, 1.2 x 0.4 x 1.4. Smallest, 0.8 x 0.3 x 0.3. Bottom lined with beach stones 0.2 x 0.3 and smaller. Located 0.5 ft. from firepit 1B24/25 East. Pile of stones 1.0 W.
1C27/28	2.0	1.1	Semicircle of either semi-circular firepit or once circular firepit. 4 main stones, both angular and smooth: largest, 1.2 x 0.6 x 0.5; smallest, 0.5 x 0.25 x 0.4. Pebbles, beach stones and angular rocks form base in 1C28.
3C24/25	1.8 x 1.8	1.2 x 1.1	Roughly circular. 8 main stones; largest, 0.8 x 0.3 x ?; smallest, 0.5 x 0.2 x ? Stones 0.3 x 0.2 line bottom. Large pile of stones 1.0 W.
1E23/24	2.5 x ?	1.6 x ?	Rectangular (only one-half could be excavated). 5 main stones used to form half: largest, 1.0 x 0.5 x 0.7; smallest, 0.3 x 0.25 x 0.5. Pebbles 0.1-0.15 diam. line bottom. Charcoal sample 1T1E24#1 from bottom gave adjusted age of 3111±220 years. Stone pile 1.0 SW.
1F18	2.5 x 1.8	1.8 x 1.3	Roughly circular. Bottom unexcavated. 7 main stones: largest, 0.7 x 0.2 x ?; smallest, 0.4 x 0.25 x ? Stone pile 2.5 S. and 0.5 from firepit 2F18.
2F18	2.7 x 2.0	1.8 x 1.1	Roughly rectangular. 11 main stones: largest, 0.8 x 0.55 x 0.4; smallest, 0.4 x 0.4 x 0.35. Pebbles 0.15 x 0.2 x 0.1 line inside. Small stone pile 0.5 N. Firepit 1F18 2.5 N.
1G18 North	1.3 x 1.2	0.8 x 0.7	Roughly circular. 6 main stones. Pebbles form base. 0.5 from firepit 1G18 South; 3.0 ft. from firepit 1G18/2G17.
1G18 South	1.7 x 1.4	1.0 x 0.8	Semi-circular or roughly circular (assuming one side originally closed). 6 main stones. Pebbles form base. 0.5 ft. from firepit 1G18 North; 2.0 ft. from firepit 1G18/2G17. Large stonepile 2.0 S.
1G18/2G17	2.0 x 2.0	1.5 x 1.3	Roughly circular. 8 main stones: largest, 1.0 x 0.3 x 0.5; smallest, 0.5 x 0.3 x 0.5. Smooth fire-cracked rocks inside. 2.0 ft. from firepit 1G18 South. 2.0 ft. from firepit 2G17. Stone pile 2.0 W. Charcoal sample 1T1G17B#1 from inside gave adjusted age of 2060±100 years.
1G19	2.3 x 2.0	1.3 x 1.0	Roughly circular. 8 main stones.
1G20/21	1.7 x 1.6	1.2 x 1.1	Roughly circular. 8 main stones. Directly above large semi-circular firepit 1G22/23. Large stone pile 1.0 SW.
1G22/23	3.5 x 3.6	2.3 x 1.8	Probably originally circular; stones on one side removed. 9 main stones: largest, 1.5 x 0.6 x 1.0; smallest, 0.4 x 0.4 x 0.2. Many pebbles 0.2-0.3 in immediate proximity. Directly below firepit 1G20/21.
2H15/16	3.0 x 2.5	1.7 x 1.0	Roughly circular. 14 main stones: largest, 0.9 x 0.35 x 0.7; smallest, 0.35 x 0.35 x 0.5. Contained many fire-cracked beach stones, ash and charcoal. Pebbles line bottom. Ash and rocks 1.0 W. Stone pile within 2.5 S.
1M14	1.6 across opening	0.8 across opening; 0.9 from opening to rear	Semicircular or originally circular. North end unexcavated. 7 main stones. Contained beach stones 0.2 x 0.15 x 0.06 broken, and 0.25 x 0.2 x 0.08 unbroken. Large patch of fish matte, ash and charcoal in front of opening to firepit.

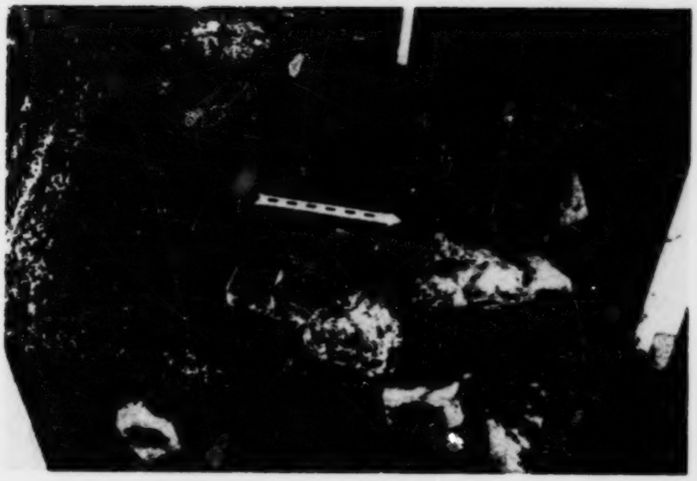


Figure 22. Rock-rimmed firepit 3A23, the largest uncovered. Arrow with scale in inches points north. The east side of the firepit is partly formed with a whale vertebra.

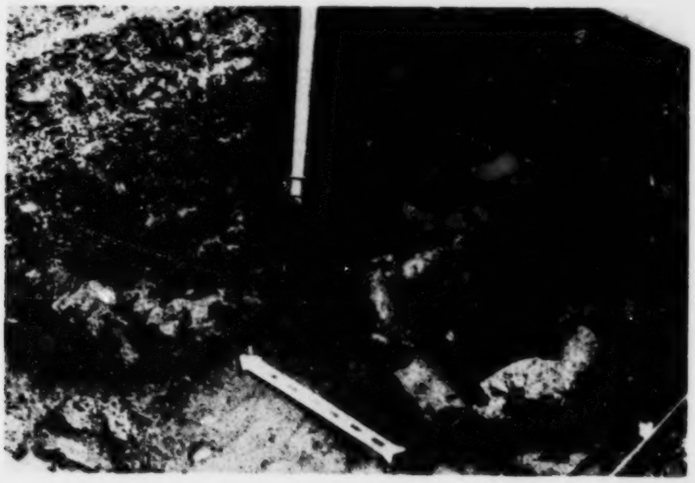


Figure 23. Rock-rimmed firepits: 1B25 North (half excavated) and 1B24/25 East (excavated).

Several firepits were spatially close to one another, both horizontally and vertically. Seven firepits in the west end of the trench clustered in grid squares 3N, 3A, 1B, 1C and 3C (Figs. 21, 23). All seven are less than 5.0 ft. horizontally from at least one other firepit, and no more than 1.5 ft. vertically from one other firepit. A cluster of nine firepits was present in the middle area of the trench, in grid squares 1F, 2F, 1G and 2H (Fig. 21). Four of these firepits were built on top of one another in grid square 1G. The other five were situated within 5.0 ft. of the 1G firepits (Fig. 21).

These two clusters indicate that the firepits were maintained in two restricted areas for a long period of time, thus suggesting that the firepit locations were relatively permanent. The long-term restricted and intensively used locations reflect containment in relation to a structure. The fact that relatively complete firepits remain and that one is sometimes built on another suggests that although the firepit locations were somewhat permanent, they were probably used intermittently, since a continuous occupation would result in firepits being pulled down instead of buried.

Both permanency and intermittent occupation could result from a well-established dwelling or permanent houseframe and seasonal abandonment, both similar to the patterns of housing construction and seasonal relocation known in early historic times. Both clusters of firepits are contemporaneous stratigraphically, spatially and by radiocarbon determinations. Assuming that both clusters were contained within a dwelling, this would suggest the several firepits of multifamily dwellings described in the early historic period. Dated charcoal samples from firepits 3N6/7 and 1G17 indicate a time span from about 350 B.C. to A.D. 90 for the earliest presence of the inferred permanently framed dwellings.

Twenty-three small holes were detected in Zone II (Table 4). They appear to have formed from wooden stakes or poles rotting away. Square and round cross-section shapes were apparent.

Two vertical square holes found in grid square/levels 2J10 and 2J11 measured 0.15 to 0.2 ft. across, and 0.8 ft. apart. They were 1.6 and 0.85 ft. deep, respectively.

Twenty-one holes were round or nearly round in cross section. In diameter they range from 0.1 to 0.35 ft., and average 0.15 ft. (n=19). The recorded depths range from 0.65 to 2.1 ft., and average 1.1 ft. (n=17). But such measurements are not necessarily the original depths of the holes. After the wood decomposed, the upper portions of the holes may have collapsed, leaving a shorter than original hole. Or, if stakes once filled the holes, the stakes may have become buried in time and then rotted away, thereby producing a hole longer than the original. Most holes were vertical, but two, 1A24 and 1L14, were oblique at a 45° angle. Only hole 2J11#3 was supported around the circumference by rocks. No evidence of support was found with the other holes. No remains of contents were found. None of the holes appears to align with others. At least 16 holes were directly associated with ash and charcoal; hole 1B23 was closely associated with firepit 1B22/23.

The round holes appear too small to have been formed by major structural features. In the buried houses at Ozette, abundant, closely placed vertical stakes with dimensions similar to the Yuquot holes supported planks and other platforms. If the contents of the Yuquot holes served this purpose, it is surprising that the holes were not more abundant and closer together. The frequent association of Yuquot holes with the ash and charcoal of small fires suggests a domestic function. Possibly the holes were formed by forcing stakes into the ground near

Table 4. Small Holes in Zone II.

Level	Diam. (ft.)	Length (ft.)	Matrix	Associations
1N9 (2 holes)				
#1 North	0.10	-*	Very wet, dense, black organic soil with numerous smooth pebbles 0.05-0.2, and sand.	The two holes are 0.1 apart in N-S orientation. Evidence of burning in nearby level 1A27.
#2 South	0.10	-*		
1A20	0.15	-*	Black organic soil, shell powder.	
1A24	0.11	1.10	Heavy, wet, black organic soil, beach pebbles, rocks, shells, ash and charcoal.	Dense ash layer 0.8 W. Charcoal scattered around level. Hole slopes obliquely to W. Ash, charcoal and top of firepit in adjacent 1B24.
1A25	0.12	1.70	Wet, black organic soil, ash patches, pebbles, rocks, little shell.	Large ash layer 0.6 E., prob. part of layer in 1A24. Ash, charcoal, and fish matte in adjacent 1N6.
1A26 (3 holes)				
#1 North	0.15	1.20	Wet, black organic soil, ash pockets, pockets of shell and bone, pebbles.	Assoc. with ash and charcoal. The 3 holes, with 2 in adjacent 2A24, form a rough N-S line.
#2 West	0.13	1.50		
#3 South	0.10	0.80		
1A27	0.20	0.95	Wet, black organic soil, rocks, pebbles, charcoal, ash and fire-cracked rocks.	Near ash, charcoal and fire-cracked rocks.
2A22	0.20	-*	Black organic soil, rocks, charcoal, ash, some decomposed shell.	Charcoal and ash in immediate assoc. with hole. Charcoal and ash in all adjacent A and B squares.
2A23	0.35	1.15	Black organic soil, rocks, pebbles, charcoal, some scattered shell.	
2A24 (2 holes)				
#1 South	0.15	1.15	Black organic soil, rocks, pebbles, charcoal, some decomposed shell.	Holes 1.4 apart. Align roughly with 3 holes in adjacent 1A26
#2 North	0.15	1.10		
1B21	-*	0.65	Black organic soil, pebbles, ash, fish bone, mussel shell.	Directly associated with ash and shell.
1B23	0.13	0.50	Black organic soil, sparse shell, ash, charcoal, pebbles and rocks.	Hole 1.2 from base of firepit 1B22/23; 1.0 from ash and rocks in adjacent 2B22.
1B27	0.15	0.35	Black organic soil, sand, pebbles, ash, charcoal, pockets of decomp. mussel shell and fish bone.	
2B19	-*	1.30	Black organic soil, pebble, rocks and decomposed shell.	Hole 2.5 from ash and charcoal.
1F17	0.20 approx.	1.00	Black organic soil, shell, ash, charcoal, fire-cracked rock.	Abundant ash, charcoal and fire-cracked rock. Firepit in 1F18.
2K9	0.15	1.20	Black organic soil, pebbles, rocks and traces of shell, ash.	Ash throughout level and above in 2K8.
2J10	0.20	1.60	Black organic soil, beach stones, pebbles, shell, fish bone patches, charcoal.	Hole is square.
2J11 (3 holes)				
#1 (2J10 cont'd)			Black organic soil, rocks, pebbles, shell fragments and fish bones.	Hole #2 is square; #3 is round, supported by rocks. Holes #1 and #2 are 0.8 ft. apart.
#2	0.15	0.85		
#3	0.15	2.10		
1L14	0.20 approx.	0.65	Fine dry black organic soil, pebbles, rocks, sand, some charcoal, ash.	Ash and charcoal scattered throughout 1L14 and in 1L13. Hole slanted at 45°N.

* Not recorded.

small fires for cooking fish. Two Webber drawings of house interiors at Nootka Sound in 1778 (Drucker 1965: 146-147) depict people cooking meat fixed on sticks stuck in the ground. Some holes may have contained stakes to support low plank partitions, as depicted by Webber and by José Maria Vasquez (Dewhirst 1978: fig. 21). The holes may also have contained the supporting framework of smoke spreaders described ethnographically by Drucker (1951: 75).

Zone III

The Zone III deposits reflect a less intensive human use of the area excavated than in Zone II, but activities similar to those inferred for Zone II. Although no rock-rimmed firepits were uncovered in Zone III, patches of ash and charcoal were occasionally encountered. The lower levels of Zone III contained several small holes believed to have been associated with cooking functions. Remains of what may have been a wooden retaining wall or house partition were also encountered in the lower levels. It appears that some lower levels of Zone III formed from household activities within a dwelling. The excavated area, however, was still clearly on the crest of the midden and the household portion of the site. Most of Zone III deposits likely formed from activities near or about the exterior of dwellings.

Zone III contains four major strata (Figs. 16, 17). Overlying the Zone II deposits in the western half of the trench was a distinctive layer of black organic soil and pebbles 0.5 to 1.0 ft. thick (IIIa). The extreme paucity of faunal remains in this layer suggests a short period of either inactivity or different activity at this location on the site. Two charcoal samples from stratum IIIa, 1T3C17B#2 and 1T2F12C#1 (Figs. 18, 19; Table 5), yielded adjusted radiocarbon dates of 1082±100 B.P. and 1185±100 B.P., respectively, which are not significantly different. They average 1130±100 B.P. or A.D. 820.

Table 5. Radiocarbon Samples and Derivations for Zone III

Sample	Wt (g)	Depth (ft.) Below Datum Elevation 36.3 ft. MSL	Matrix and Associated Features	Stratum	Lab. Code	Reported Age (5570 Half-Life)	Adjusted Age (5730 Half-Life)
1T1A11#2	3.5	5.20	Black organic soil, shell, some fish bone.	IIIc/ IIId	GaK-2854	1920±100	1978±100
1T2A13A	25.3	7.50	Black organic soil and decomposed shell.	IIIc	GaK-2181	1540±110	1586±110
1T3B13	44.3	7.30	Decomposing mussel shell.	IIIc	GaK-2184	1120±80	1153±100
1T3C15	10.4	7.60	Black organic soil mixed with decomposing shell and fish bones.	IIIc	GaK-2189	1300±80	1339±100
1T3C17B#2	16.7	8.64	Black organic soil, stones, and a few shells.	IIIa	GaK-2190	1050±100	1082±100
1T2F12C#1	14.0	9.85	Black organic soil, rocks, pebbles and some shell and bone.	IIIa	GaK-2192	1150±90	1185±100
1T1G8A#1	9.5	8.85	Black organic soil, decomposed shell and fish bones.	IIIc	GaK-2855	980±150	1009±150
1T1H10#1	36.4	11.16	Black organic soil and rocks.	IIIb	GaK-2194	1050±80	1082±100
1T2J8#2	59.2	11.63	Black organic soil, rocks and pebbles.	IIIb	GaK-2197	1250±80	1287±100

Overlying the thin layer is the major stratum of Zone III: compact black organic soil with decomposing mussel shells and fish bones (IIIc). It contained large amounts of mussel shell in various stages of decomposition, ranging from abundant flecks of shell in black organic soil to extant lenses of concentrated decomposing mussel shells. Four charcoal samples from the middle to lower levels of this stratum were radiocarbon dated: 1T2A13A, 1T3B13, 1T3C15 and 1T1G8A#1 (Figs. 18, 19; Table 5). A chi-square test of the adjusted radiocarbon ages from the four samples found the adjusted age of 1586±100 B.P. for sample 1T2A13A to be significantly different. This deviancy cannot be accounted for.

The uppermost stratum of Zone III in the western half of the trench was compact black organic soil with pebbles, rocks and sparse decomposed shell (IIId). It suggests formation moreso from decomposing vegetation than cultural deposition. Charcoal sample 1T1A11#2 from the interface of strata IIIc and IIId yielded an adjusted radiocarbon age of 1978±100 B.P. The provenience of the sample near the historic period deposits clearly makes this radiocarbon date suspect. Chi-square comparison with the four adjusted dates from stratum IIIc also showed the nearly 2000-year-old date to be deviant.

In the east half of the trench (squares H-M), recorders could not discern a stratigraphic change separating Zones II and III. The levels here were initially designated "Zone II," but subsequent analysis of the faunal remains and artifacts enabled detection of Zone III arbitrary levels (IIIb) by the presence of stone fish-hook shanks and increased ratios of sea mammal and sea bird bones. Assignation of the arbitrary levels to Zone III receives further support from a chi-square test on a group of seven adjusted radiocarbon dates. Five from samples in strata IIIa and IIIc (1T3B13, 1T3C15, 1T3C17B#2, 1T2F12C#1, 1T1G8A#1) and two adjusted dates from samples (1T1H10#1, 1T2J8#2) from the arbitrary levels in question were found to be not significantly different. They average 1162 radiocarbon years B.P. or A.D. 788. This indicates that Zone III began to form at ca. A.D. 800.

Zone III terminates with the formation of historic period deposits discussed under Zone IV.

Two poorly preserved features in Zone III were the remains of low wooden wall-like structures oriented horizontally.

In grid square/level 2G7B, a partly burned piece of wood extended northward from the posthole in square 2G for more than 4 ft. Many fragments of decomposing and burned wood directly above the beam suggest a crude wall or partition.

A similar feature in square 2J appeared to be a single piece of wood extending from 2J7 upwards to 2J1. It was also oriented in a north-south direction. It measured more than 4.0 ft. long (part extended south beyond excavation limits), more than 0.3 ft. thick and about 3.5 ft. high.

The low wall-like nature of the feature suggests either the plank partitions used within multifamily houses, or low, plank-retaining walls built along the edges of houses to keep midden from spreading into the house interior. The latter seems more probable. Initially half-buried retaining walls would likely eventually become covered by midden and leave archaeological remains.

The lower levels of Zone III contained 13 small, round, vertical holes (Table 6). They ranged in diameter from 0.1 to 0.3 ft., and averaged 0.2 ft. (n=13). Recorded depths ranged from 0.4 to 2.6 ft., but such measurements in view of factors discussed for the Zone II small holes do not necessarily indicate original depths. Three holes in grid square/level 2D16 contained fragments of wood. All 13 holes were associated with ash and charcoal, which suggests the possible domestic functions of the Zone II holes. The three holes containing wood in 2D16 and one hole in 1D17 align on a north-south axis. They may have contained the remains of stake supports for a plank partition or retaining wall.

Table 6. Small Holes in Zone III

Level	Diam. (ft.)	Length (ft.)	Matrix	Associations
1D17	0.20	2.60	Black organic soil, fine decomposed shell, some charcoal.	Ash and charcoal directly assoc. in 1D17 and adjacent 1E12. Aligns with 3 holes in adjacent 2D16.
2D14	0.30	2.00 approx.	Black organic soil, hard fine shell.	Charcoal directly assoc. Continues as 2D16#1 North.
2D16 (3 holes)				
#1 North	0.20	1.00	Black organic soil, shells, charcoal, rocks.	Charcoal directly assoc. Holes contain wood. Align with hole in 1D17 to form straight line.
#2 Middle	0.20	1.00 - 2.00		
#3 South	0.20	1.00 - 2.00		
1E13 (2 holes)				
#1 North	0.20 - 0.20	1.00	Black organic soil, shells, ash and charcoal.	Abundant charcoal. Holes 1.0 apart. Do not align with holes in 2D16 and 1D17.
#2 South	0.10 - 0.20	1.00		
1F14	0.10 - 0.15	1.00	Black organic soil, shells, charcoal, ash, pebbles, bones.	Abundant ash and charcoal, also in 1F13.
2F8 (2 holes)				
#1 North	0.10 - 0.20	0.60	Black organic soil, little decomposed shell, pebbles.	Ash and charcoal in adjacent 2E10.
#2 South	0.10 - 0.20	0.40		
2J5 (2 holes)				
#1 North	0.10	0.70	Black organic soil, rocks, sparse decomposed shell, pebbles, ash and charcoal.	Abundant ash and charcoal. Ash in adjacent 1J5.
#2 South	0.10 - 0.20	0.90		
1L6	0.30 approx.	0.50	Black organic soil, pebbles, shell, fire-cracked rocks, ash.	Abundant ash and charcoal and in above level 1L5.

Zone IV

The zone deposits formed exclusively in the historic period, from the late 18th century until 1966, the excavation year. They reflect continuity of native culture, ecological change, 18th century European presence and Nootkan acculturation during the past 100 years.

Zone IV contained five major strata (Figs. 16, 17). In the eastern half of the trench (squares H-M) a distinctive stratum of loose, black organic soil, pebbles, rocks and sparse decomposed shell (IVb) overlay the arbitrary Zone IIIb levels. Near the bottom of the slope (squares F-H), stratum IVb overlays a distinctive lens of loose, black organic soil with rocks and decomposing clam and mussel shells (IVc). This lens rests directly on Zone III deposits. Part of the lens appears to be backdirt from a house posthole dug in squares 2F and 2G (Figs. 15, 17) in the historic period. Overlying strata IIIc and IIId on the crest of the mound (squares A-D) was a distinctive stratum of compact black organic soil with pebbles and rocks (IVa). Overlying strata IVa and IVb on the midden crest and beachward slope (squares D-G) was loose, well-preserved shells of clams and other infaunal molluscs, fish bones and black organic soil (IVd). Black topsoil and grass roots form the surface layer of the midden (IVe); part of the surface in grid squares H-M includes a pebble path.

Prehistoric and historic midden deposits can be distinguished by the predominance of epifaunal or infaunal mollusc remains, respectively. The prehistoric strata (Zones I-III) contain remarkably high ratios of epifaunal molluscs, particularly Mytilus californianus, compared to infaunal species, but in the historic period (Zone IV) deposits the ratios are dramatically reversed (Clarke and Clarke 1974a, b). This sudden change in the ratios of mollusc species appears to have resulted from an ecological response to the severe overhunting of the sea otter in the Nootka Sound area very early in the historic period; absence of the sea otter allowed one of its major food sources, infaunal molluscs, to flourish (Clarke and Clarke 1974a, b). Similar ecological shifts due to sea otter depletion have been reported for the western Aleutians (Simenstad et al. 1978).

The contexts of dated European artifacts found only in Zone IV indicate considerable disturbance of the strata. Late 18th century artifacts sometimes occurred with late 19th and 20th century artifacts. It was not unusual to find such artifacts in the lower levels of Zone IV. On the midden crest (squares A-D), artifacts in the upper levels are mixed, but some lower levels appeared intact: 1B4, 3B3, 2B5, 1C4-5, 3C4-6. Mixing of early and late European artifacts in the rest of the trench (squares E-M) indicates that many Zone IV deposits there were disturbed, especially under part of the former site of Captain George's early 20th century house (squares H-M) which was burned and levelled. The disturbed deposits are also the result of postholes, trashpits, shallow burials and Spanish and possibly native gardens.

The contexts of dated European artifacts indicate that Zone IV formed exclusively during the historic period, probably beginning with the first Spanish occupation of Yuquot in 1789. Although Cook's visit of 1778 and visits of early maritime fur traders from 1785 to 1789 undoubtedly contributed some cultural remains to the midden, no non-Spanish 18th century artifacts dating to a specific year or short span of years were recovered. No non-Spanish European artifacts could be directly associated with changes in stratification, probably a reflection that most trading with Europeans took place on board ships. Meares' factory and construction of the North West America in 1788 have no doubt left some archaeological traces, but this occurred in "Meares' Corner" at the northwest end of Friendly Cove and does not relate directly to the historic period deposits opened by the excavation trench. Some 18th century Spanish and Mexican ceramics (Ward et al. 1973; Lueger 1976) were recovered from the above-mentioned, apparently intact deposits on the midden crest. Shards of a Mexican earthenware storage vessel were found directly associated with burial 1C6/7 in the lower levels of Zone IV. Such artifacts undoubtedly came from the Spanish occupations of 1789 and 1790-95. The Spaniards destroyed the Nootkan houses, established several buildings, other structures and gardens and followed a very different subsistence pattern in contrast to the Nootkans. All this no doubt brought about the change in stratification so apparent in Zone IV. Presumably a year of Spanish activities would be required to effect noticeable changes in stratification. Thus, the Zone IV deposits are seen as beginning in 1790, even though large quantities of European goods had been coming into Yuquot for five years previous.

One charcoal sample from Zone IV was dated: sample 1T2H4#2, 10.2 g, from stratum IVb, 8.79 ft. below datum elevation 36.3 ft. MSL, or 2.2 ft. below the surface (Fig. 18). Sample 1T2H4#2 gave a reported radiocarbon date of 1330±80 B.P. (GaK-2852). This is clearly deviant for deposits with abundant European artifacts. Sample 1T2H4#2 may have been prehistoric material mixed into later deposits through construction of the posthole in nearby squares 2F and 2G (Figs. 15, 17).

Disarticulated and fragmentary human skeletal material was present in all four stratigraphic zones, but only in Zone IV were there instances of sufficient remains to suggest an actual "burial." Because the human remains are reported by Cybulski (1972), only the archaeological contexts and more apparent Nootkan aspects of the three "burials" are discussed here.

Burial 1A2 as a sample consists only of a humerus and a well-preserved, but crushed, skull without a mandible. They were collected at the lowest levels of the grass roots in the northwest corner of grid square 1A2, which was enlarged to include the skull. The skull lay on its left side with the face more or less downward. It rested on beach stones, small angular rocks and black humus midden soil. Higher parts of the skull were among complete clam shells, black humus and grass roots.

The rest of the skeleton appeared to angle away from the excavation limits, but could not be removed without narrowing the distance between the excavation and a nearby cesspool. Later in the season, slumps along the west wall of square 1A revealed a spinal column and other bones of a more or less complete skeleton which likely belonged to the excavated skull. This skeleton was oriented northeast-southwest, with the head to the northeast. No indications of a grave were present.

The other major human skeletal remains were found in grid squares and levels 1C6 and 1C7, the lowest levels of Zone IVa. It was believed during excavation that these remains represented two separate "burials," which were thus recorded as "burial no. 2" and "burial no. 3." The extreme proximity of the remains to each other, however, strongly suggests that there was only one "burial" of two persons. Cybulski (1972) observes that the postcranial bones of burial no. 3 represent at least two individuals, and one or more of the bones may have belonged to burial no. 2.

Burial no. 2 or burial 1C6 consisted of a single crushed skull without a mandible. It was almost upside down, facing downward and eastward in black organic soil with small pebbles. Within 2.0 ft. to the east and south of the skull were three large fragments of a Mexican earthenware storage jar. This dates the burial to the late 18th century, presumably during the Spanish occupations of Yuquot from 1789 to 1795, or shortly thereafter.

Burial no. 3 or burial 1C6-7 was 0.3 ft. below and within 2.0 ft. of the above skull. The lower remains consisted of a skull, without a mandible, and several postcranial bones. The skull was upside down and face down with the top of the head oriented toward the east. Postcranial bones lay within 2.0 ft. of the skull. They were incomplete with almost no bones articulated. The close proximity of the bones to the skull suggests that the body was originally flexed or semi-flexed, but this interpretation is speculative. The skeleton lay in a matrix of black organic soil, pebbles and rocks. There was no indication that a grave had been dug into the midden for the corpse(s). They were likely either left on the ground surface or deposited in a very shallow grave that left few or no traces in stratification.

Since all three "burials" were in historic period deposits, it is reasonable to interpret them in light of historic Nootkan mortuary practices (Drucker 1951: 147-50). Normally, corpses were crammed into boxes, removed from the village, and placed in a burial cave, rock shelter, tree, or taken to a specific location known to the family. Although skulls of individuals might be removed later for magical or religious purposes, the skeletons were not dismembered or broken up. Seen in this light, the excavated remains do not represent orthodox burials. Since the individuals were not properly buried, they likely had no kinsmen at Yuquot and were probably aliens. Indeed, the skull of burial 1A2 was artificially deformed in the style preferred by the Coast Salish (Cybulski 1972). The crushed skulls and incomplete, "unburied" remains suggest that the individuals met violent ends. Perhaps these persons were either slaves, dispatched for tcitcmō, as death companions for the recently deceased, or mutilated war captives (Drucker 1951: 333-34, 341-42).

Eight vertical small round holes were found in Zone IV (Table 7). They are typical of the small holes and associations in the underlying two zones. The holes ranged in diameter from 0.15 to 0.3 ft., averaging 0.19 ft. (n=6). Recorded depths varied from 0.7 to 2.3 ft. Hole 1G4-8 contained remains of a cedar shaft. Hole 1M5 was supported around the circumference by rocks. Five holes were associated with ash and charcoal. Although some holes were close to one another, no three were close enough to suggest an alignment.

Table 7. Small Holes in Zone IV

Level	Diam. (ft.)	Length (ft.)	Matrix	Associations
1G4-8	0.15	2.30	Black organic soil, pebbles, decomposed shell, mammal bones, fish bones.	Hole vertically oriented. Wooden shaft remains.
2G2	0.20 - 0.30	1.50	Black organic soil, broken well preserved shell, small stones.	
2G3 (2 holes)				
#1 (2G2 hole cont'd.)				
#2	0.15 approx.	-*	Black organic soil, well preserved broken shells, small stones.	Holes 3.0 apart.
2J6	0.15 approx.	-*	Black organic soil, concentrated decomposing mussel shell, rocks.	Hole 0.8 from ash, charcoal and rocks.
2K6 (2 holes)				
#1 North	-*	0.70	Black organic soil, rocks, pebbles, patches of decomposed shell, ash and charcoal.	Holes 0.5 apart. Abundant ash, charcoal and bones.
#2 South	-*	-*		
2L6	0.20	0.65	Black organic soil, pebble, rock, sand, some charcoal, ash.	Abundant ash and charcoal in 2L6 and above 2L5.
1M5	0.30 - 0.20	1.20	Black organic soil, ash, charcoal, pebbles, powdered fish bone.	Hole supported by rocks. Ash and powdered fish bone 3.0 in 1M5. Charcoal and ash 2.5 in 2M5.

* Not recorded.

Most holes were found in the lower levels of Zone IV which date to the early historic period. The Zone IV holes, typical of those in earlier strata, indicate continuity of a traditional practice into the early historic period. If the interpretation presented earlier for the functions of holes in Zones II and III is correct, then the Zone IV holes were likely produced by traditional household practices. The absence of holes in the middle and upper Zone IV deposits may reflect discontinuity of such practices in the later 19th century, when houses become increasingly Eurocanadian.

Zone IV contained the remains of four large posts which were set into the ground during the late to recent historic period. All four postholes penetrated prehistoric deposits in underlying zones.

Grid square 1A contained a large posthole with few remains of the post. The upper part of the hole in 1A2 was roughly oval in outline, measuring 2.5 by 3.5 ft. The hole tapered gradually inward to a base about 2.0 ft. in diameter, in 1A10, about 5 ft. below the ground surface. The pole had been removed; only some of its fragments and large supporting rocks remained. Some trash - tin cans, glass, pottery - were thrown in the hole, probably as fill, after the post was removed.

Grid square 2G contained a large cedar post still relatively intact (Fig. 15). The south side of the post extended beyond excavation limits and therefore could not be fully exposed. The posthole, however, was originally nearly circular in outline, about 2.5 ft. in diameter and about 5 ft. deep. The post was about 1.6 ft. in diameter and originally more than 6.7 ft. long. The upper portion had been buried by recent historic deposits and had rotted considerably. This post is on the site of Captain George's house, an early 20th century two-storey frame building, and could have been part of its foundation.

Remains of a third post and posthole were found in the south end of grid square 1L and adjacent north edge of 2L. The upper part of the posthole in 1L2/2L3 was roughly circular in outline, measuring 2.0 to 2.7 ft. in diameter. Similar dimensions were found at the bottom, 4.5 to 5.0 ft. below the ground surface. Remains of the post indicate that it was originally about 2.1 ft. in diameter. This post may have also been part of the foundation of Captain George's house.

Remains of the fourth post were encountered in grid square/level 1M5. The upper portions of this post were disturbed or removed. During excavation, part of the baulk around the post crumbled away, preventing accurate determination of the hole shape and dimensions. The hole, however, extended about 4.5 ft. below the ground surface and measured about 2.7 ft. across. Remains of the post were 2.0 ft. wide and about 1.0 ft. thick. The post was situated only 4.5 ft. eastward from the above described post in square 1L. Both posts were likely part of the foundation of the same structure.

All four posts share several distinctive attributes, which suggest their function. None have asymmetrical foundation holes with a sloping side for setting in large traditional houseposts, as described by Drucker (1951: 73). Rather, all have cylindrical-like holes, roughly 5.0 ft. deep and about 2.5 ft. in diameter. The size of the posts, 1.6 to 2.7 ft. in diameter, is relatively moderate compared to posts of the 19th century plank houses. The tops of the postholes are very close to the ground surface, which indicates that the posts are recent, probably within the 20th century. By this time, the Nootkans were building Eurocanadian style houses raised a few feet above the ground on foundation posts approximately the size of the excavated ones. All four excavated posts are likely such foundation remains.

Several badly rotted planks and boards were uncovered near the surface of Zone IV. Most appear to be debris from 20th century buildings. None of the remains related adequately to others to form a discernable integrated structure such as a platform or frame house.

Just below the grass roots in squares 2A2/3A2/2B1, an irregularly shaped piece of plank lay at right angles between two long parallel lengths of wood. One side of the plank extended beyond excavation limits and could not be excavated. The excavated section measured about 3.5 ft. long by 1.5 ft. wide by 0.07 ft. thick. The north length of wood, which extended beyond excavation limits to the west, appeared to have once been part of a similarly oriented piece in square 2B1. The north length of wood measured more than 10.3 ft. long, 0.3 to 0.4 ft. wide and about 0.15 ft. thick. The south parallel length of wood lay about 3.5 ft. from the north one and extended into square 3B1. This wood measured more than 5.2 ft. long, 0.4 to 0.6 ft. wide and about 0.15 ft. thick. Although the above-described plank and lengths of wood were extremely rude, their dimensions and relative positions suggest the base of a rough frame house or shack.

In square 3C5 a cedar log or board extended south beyond excavation limits. It measured more than 4.6 ft. long, 0.3 to 0.4 ft. wide and about 0.4 ft. thick.

In squares 1H3/4 and 2H2 a log may have served as a crude plank or board. It was 5.9 ft. long, 0.3 to 0.4 ft. wide and 0.15 ft. thick.

Squares 2J2 and 2K2 contained the remains of four, possibly five, sawn boards. They measured 0.5 ft. wide by 0.08 ft. thick; two were 4.2 ft. long, and another, 2.7 ft. long. They are likely remains of a board walkway or the flooring of a frame house, because they are on the location of a pebble path and former site of Captain George's house.

In squares 1M1 and 2M2 many fragments of wood were found on the pebble path. These are probably remains of planks or boards placed on the path for walking on during heavy rains.

Artifact Analysis

The primary objective of the indigenous artifact analysis is to develop a culture sequence and culture history model which will answer basic questions asked earlier in the archaeological research objectives. Development of the sequence and model, however, must take into account various problems, most of which are involved with the artifact classification and inference of functions for artifact classes. The classification is the keystone of the culture sequence. Most classifications of Northwest Coast artifacts have emphasized material industries and skeletal elements of artifacts, with little attention to shape and function. Classification of the Yuquot indigenous artifacts will attempt to concentrate on shape and inference of function for aritfact classes by means of the direct historical approach. The classes will then be organized into broad functional categories that reflect technological and subsistence practices. The classification itself will thus partly define technology and subsistence orientation. Finally, the artifact classes will be ordered through time on a cultural continuum model of four periods, each based on dated stratigraphic contexts. A general culture construct based on the artifact classes and their broad functional categories will examine cultural continuity and change for each period.

Classification of bone and antler artifacts from Northwest Coast midden sites is a thorny problem for archaeologists. A large proportion of the assemblages consists of numerous similarly, but yet differently shaped bone points. These were once parts of composite artifacts that included plant and other materials that have decomposed, leaving the bone and antler points. Different complete composite artifacts from museum collections and wet sites may be found armed with similarly shaped bone points. Conversely, the same type of composite artifact, such as a fish-hook, may be armed with variously shaped bone points. For these reasons some archaeologists consider many of the pointed bone and antler artifacts non-diagnostic of function (Friedman 1976: 162-164). This, however, may be a premature or qualified conclusion, as there does not yet appear to have been thorough enough study of the arming points of complete composite artifacts. If some bone points are used on similar artifacts or even reused on different artifacts, it should not necessarily make such bone points non-diagnostic or less worthy of attention.

Part of the problem of classifying the "non-diagnostic" bone points appears to lie in perception. Archaeologists have wanted or expected to find, and thus consequently defined finer, more consistent attributes of shape and size than the shapes and sizes that occur among the artifacts. Many of the inconsistent and various shapes that make the arming points so difficult to classify are simply poor or sloppy renderings of a simple attribute, such as an upturned proximal spur on a self-armed salmon harpoon head, which can tolerate a considerable degree of variation and yet apparently work. Complete composite artifacts with well-finished, carefully shaped arming points give clues to preferred or ideal shapes. After studying the interrelationship of the attributes of the arming point to the other parts of the composite artifact, one can recognize the uses of particular shapes on the arming points. It is then often possible to recognize "poor," but nonetheless operational, renderings of certain shapes. To be sure, every assemblage will have arming points whose attributes cannot be easily recognized or defined, and hence such artifacts become classed in a miscellaneous category. The manufacturers of such artifacts probably recognized specific uses for the poorly rendered shapes, however.

Method of Study

The problem of classification was initially approached with methods that would yield a numerical taxonomy of the artifacts. This approach, soon found to be unfeasible in the Yuquot situation, was abandoned for a descriptive classification partly based on the direct historical approach.

After the artifacts were cleaned, numbered and cross-mended, they were sorted into broad groups based on general shared resemblance. Once these groups were formed, and the differences and similarities of the artifacts became familiar, the possibilities of attribute analysis that would provide a numerical taxonomy were explored. Numerous potential attributes for each specimen were recorded with the intention of using a computer to find clusters of significant attributes. Common and diagnostic attributes could be detected and worked into a classification system. Such an analysis is feasible with relatively standarized artifacts, such as ceramics or art objects, whose properties are consistent enough from one artifact to another to allow attributes to be precisely defined and found. However, the idiosyncratic, broadly varied shapes of many ground bone and antler artifacts from Yuquot were often so inconsistent within a group of similarly shaped artifacts that a defined shape was often found to have very limited frequency within a group, and consequently virtually no predictive value for the classification. Attribute shapes within groups of physically similar artifacts varied so much that measurement of a shape attribute, even by means of a pencil follower unit that enters shapes into a digital computer (Clarke 1968: fig. 121), which then measures their similarity, would give such a wide range of measurement as to be meaningless for comparison and predictive value.

It was therefore decided to revert to a traditional, descriptive classification. All complete and nearly complete specimens were separated to provide a comparative reference for fragmentary and uncompleted specimens. Like was grouped with like. There was no attempt to introduce provenience into the classification because the assemblage is extremely homegeneous - obviously the product of one culture. Whenever fragmentary specimens could be reasonably identified from comparison with the intact artifacts, they were included in the classification. However, some 1107 specimens were found to be too fragmentary, too eroded, too gnawed, too uncompleted or otherwise unrecognizable and had to be excluded from analysis. A working sample of 3031 specimens was then left for analysis. The proveniences of artifacts that were once parts of composite objects, or believed to have been so, were examined to see whether other parts of the same composite object were nearby, or could be recognized and reunited. Artifacts from the same and adjacent grid squares were compared with one another to see whether they came from the same composite object. Apart from matched parts found together in the field, none could be found in the laboratory examination. In addition, all three dimensionally recorded artifacts were plotted on profiles and plan drawings of features to detect living floors, associations with features and artifact concentrations. Plotting revealed a relatively consistent distribution of artifacts on the profiles.

After the search for additional contextual attributes, the groups of artifacts were further refined into classes defined by shape, size, material or skeletal element, wear patterns and function, if known. Because of the common, homogeneous shapes of individual attributes, few artifact classes can be distinguished from others by diagnostic attributes alone which indicate function. In the Yuquot situation, it is more meaningful to describe the artifact classes as patterns or combinations of attributes, many of which occur on artifacts of other classes, and attempt to show how they are interrelated to one another within a class. It is often the patterning of shared or common attribute shapes, found individually among other classes, that distinguishes one class from another. Single diagnostic attributes that distinguish one class from another, or indicate function are pointed out. Although the classes are archaeological definitions for analysis and comparison, it is believed that objects in a class served the same functions culturally. Whenever possible, these functions are argued for, or identified, by several means.

Considerable effort was made to define wear patterns on artifacts and to infer function from the wear patterns, as suggested by Semenov (1964). He may illustrate ideal examples because the Yuquot artifacts do not display such apparent patterns. Sharpening and breakage have obliterated most wear striae, but those that could be discerned are described and, when possible, attributed to uses.

Another means of determining further attributes for inference of function is detection of lashing and hafting stains on the bone and antler artifacts. Examination of complete composite artifacts such as fish-hooks, harpoon heads and arrows in museum collections revealed that red cedar wood, spruce gum and lashings of wild cherry bark and cedar bark often discoloured bone, antler and wood parts that were in direct contact with these materials, sometimes forming a neat "carbon copy" of the lashing or hafting. Similar discolourations on specific surfaces were observed on the same types of artifacts. In some instances these stains are very well defined and likely indicate lashed or hafted surfaces. The stains on most artifacts are irregular and less extensive but do occur on probable lashed and hafted surfaces. Examination of the bone and antler artifacts under short-wave and long-wave ultraviolet light reveals larger and denser discoloured surfaces than are apparent under usual light conditions. These discolourations may have resulted from one or more agents: blood from animals caught, sea water, ground water, dirt, oils from native handling, perspiration and oils from handling the artifact in the laboratory, and lashing and hafting materials. Samples of wild cherry bark, cedar bark, red cedar wood and yellow cedar wood were collected for experiments in stain detection, which became too complex for the present analysis.

However, identification of the surface stains on the bone and antler artifacts has great potential for not only determining the lashing and hafting materials and their contact areas on the artifacts, but also the animals caught with the artifacts. Further investigation of these possibilities would involve examination of the artifacts before disturbance of their surfaces by sunlight, handling and washing. An energy dispersive X-ray fluorescence spectrometer could possibly be adapted to map elements on the undisturbed artifact surfaces. The X-ray fluorescence given off from stains on the surfaces could then be identified from comparison with the known X-ray fluorescence of materials that may have stained the artifacts: fish blood, mammal blood, cherry bark, nettle fibre, sinews, etc. A project of this nature would be invaluable for furthering our understanding of the many morphologically similar, yet functionally different, bone and antler points in Northwest Coast middens.

Ethnographical collections of Nootkan material culture revealed much of the original appearance of the protohistoric and historic period archaeological specimens and their functions. Complete composite artifacts showed the interrelationships and variations of attributes common to the same types of ethnographical and archaeological artifacts. This aided the selection and understanding of attributes for the artifact classification. Identification of attributes and functions of artifact classes was inferred by comparison of archaeological specimens with museum specimens. The catalogue numbers of key museum artifacts are given in this report for reference. Holding institutions of these artifacts are abbreviated as follows:

AMNH	American Museum of Natural History, New York.
BCPM	British Columbia Provincial Museum, Victoria.
MAE	Museum of Archaeology and Ethnology, Simon Fraser University, Burnaby.
MAI	Museum of the American Indian, Heye Foundation, New York.
MM	Museum of Mankind (formerly British Museum), London.
NMM	National Museum of Man, Ottawa.
PM	Peabody Museum, Harvard University, Cambridge.
PMS	Peabody Museum of Salem, Salem, Mass.
WSU	Washington Archaeological Research Center, Washington State University, Pullman.

In addition to material culture collections, the Nootka Sound area is well covered in historical and ethnographical records, particularly for the late 18th century. These assisted considerably in the identifications of artifacts and in understanding Nootkan cultural contexts.

Finally, in 1969 an attempt was made at ethnoarchaeology. A wide range of relatively complete indigenous artifacts was shown to elderly Nootkans from Yuquot, Hesquiat, Ehetisat, Nuchatlitz, Gold River, Opitsat and Port Alberni. It was hoped that the attributes and functions of the artifacts from the historic period at least, as perceived and understood by the Nootkans, could be recorded and entered into the classification. However, Nootkan culture has changed so much that only a few artifacts were within the direct personal experience of some old people. Several other artifacts were recognized or identified through folk memory. Most artifacts, however, could not be recognized. Identification was hindered by the fact that most artifacts are parts of composite objects which, when complete, appear quite different. If complete composite objects could have been shown, more identifications could likely have been made. Photographs of complete hunting weapons and fishing gear were also shown, but most elderly people had poor eyesight. A large magnifying glass helped slightly, but made the whole process awkward and taxing. Another problem was to determine the English names of small nearshore marine fishes named in Nootkan. Given the difficulties of identification from photographs and drawings, the most reliable procedure would have been to collect the species in question, but this was not possible under the circumstances. The elderly Nootkans nonetheless identified some artifacts and made valuable comments. These are included in discussions of the particular artifact classes.

After the methods described above were used to identify attributes, classes, and functions of artifacts, the classes were organized into broad functional categories that reflect major aspects of culture and subsistence: manufacturing technology and basic tools; fishing with hooks and lines; fishing with harpoons, leisters, and other devices; hunting with arrows; hunting with harpoons; personal adornment and ceremonialism.

In the following described classes, incomplete dimensions of artifacts are marked with a +. Classes that contain several artifacts whose dimensions show little variance, and therefore appear to be diagnostic, are described statistically. The distribution of such dimensions is expressed as a measure of central tendency and deviation from the mean. Colour names and notations follow the Munsell colour system (Munsell Color Company 1960). Matchings of artifact colours to the Munsell colour chips were made under natural light conditions.

Manufacturing Technology and Basic Tools

Archaeological analyses have traditionally tended to focus on categories of materials worked, such as bone, antler, wood, etc., as separate "industries," thereby implying substantially different manufacturing technologies for each material. The simplicity of the Nootkan "carpenter's kit" (Drucker 1951: 77-79) and examination of the different worked materials recovered archaeologically from Yuquot indicate that it is more correct in the Yuquot case to see the industries as variations of a single, basic manufacturing technology applied to several different materials: bone, antler, tooth, shell, stone and wood. Only textile manufacture and hide working appear to be substantially different. These industries cannot be identified archaeologically to any degree at Yuquot and therefore will not be discussed.

Nearly all the artifacts and worked materials recovered have been so extensively modified that they provide little information on the first stages of manufacture. The long bones of land mammals often appear to have been spirally fractured to provide smaller pieces for working into artifacts (Fig. 24a,b,f). Some worked bone and antler has been chopped and then snapped off (Fig. 24k). More commonly, however, the materials have been split into preforms (Fig. 24c,d,g,h). Splitting appears to have been used on any grained material, including sandstone. Stone, bone and antler were also sawed longitudinally or transversely from opposing sides so that it became weak enough to be snapped apart (Figs. 24e,i,j; 25). Abrasive blocks and saws and hard stones were roughly shaped by battering and pecking (Figs. 28h, 33 g, 67). Following rough shaping, most artifacts have been heavily abraded into shape with pieces of sandstone or siltstone. Finishing was probably by means of fine-grained sandstone or siltstone, or perhaps dogfish skin as known in the historic period. The finish on bone artifacts in the protohistoric and historic periods becomes more faceted as a result of whittling (Fig. 188), probably from iron tools. Perforations are conical in thin artifacts, or biconically in thicker artifacts, made by boring a hole probably with an awl-like device. True drills, which produce a long parallel sided perforation, do not seem to have been present until late in the historic period.

A total of 2315 artifacts representing the basic manufacturing technology was recovered, comprising the class groupings of abraders, hammerstones, wedges, celts and perforators. Included in that total are classes belonging to textile manufacture: cedar bark working tools, needles and shuttles and possible net gauges. Zonal distribution is as follows: Zone I, 285; Zone II, 967; Zone III, 592; Zone IV, 329; without provenience, 142.

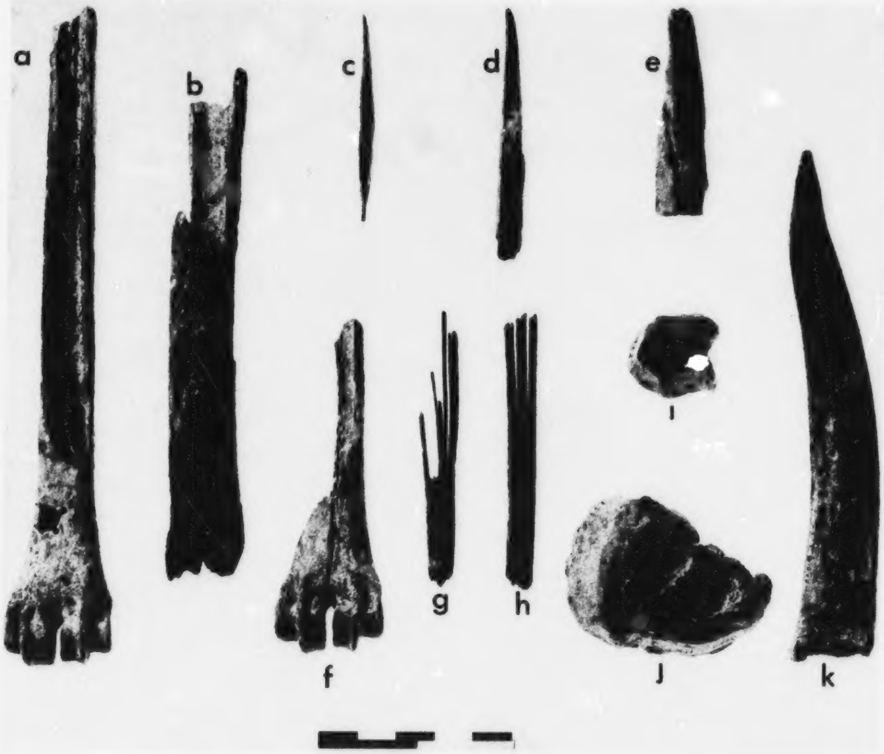


Figure 24. Examples of bone working techniques. Drilling and punching: a, 1T2G2-5362x from Zone IVd. Spiral fracturing: a; b, 1T3B1B from Zone IVd; f, 1T1C10 from Zone IIIc. Splitting: c, preform 1T1A2 from Zone IVa; d, 1T1A2 from Zone IVa; g, 1T2C7 from Zone IVa; h, 1T2B23-1075 from Zone IIa. Longitudinal sawing: e, 1T2B12 from Zone IIIc. Transverse sawing: i, 1T3C22 from Zone IIa; j, 1T1C10 from Zone IIIc. Chopping: k, 1T1C20 from Zone IIa. (Scale: cm, in.)

Abraders

Abrasive tools, abundant in Northwest Coast archaeological sites, are barely mentioned in both early explorers' accounts and later ethnological reports. Early explorers were more interested in other aspects of native culture and seldom recorded information on abraders. By the close of the 19th century, when the first detailed material culture studies were undertaken on the Northwest Coast, the native peoples were well integrated into a monetary economy and had largely adopted factory-made tools. Stone abraders, compared to earlier times, were used very limitedly. Curiously enough, nearly a century of anthropological interest in Northwest Coast material culture has ignored abraders when there is no question that such tools were fundamental in producing the rich material culture in wood, stone, antler, bone and shell. Only Boas seems to have been explicitly aware of the importance

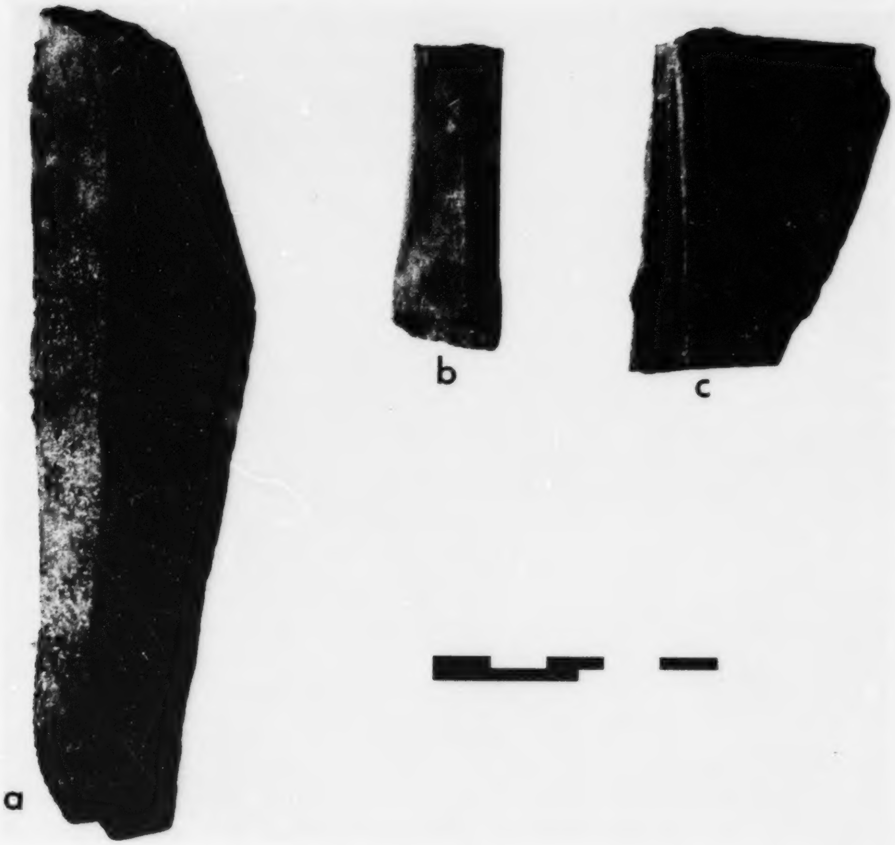


Figure 25. Worked stone. Fractured and ground basalt: a, 1T2F14A-2323 from Zone IIa. Ground siltstone sawed longitudinally on opposing faces and then snapped apart: b, 1T1C13A-852 from Zone IIIc; c, 1T1E13-2301 from Zone IIIc. (Scale: cm, in.) (Photo by R. Chan.)

of abraders. His statements on their use among the Southern Kwakiutl apply equally well to the Nootka and other Northwest Coast cultures:

> Stonework was done by battering down tough, hard stones into the desired shape and finishing them by grinding and polishing. Softer stones were cut by grinding with gritty stones and by polishing ... Blocks of wood used for making small dishes are hollowed out with the chisel and smoothed with gritty stones and dogfish skin (Boas 1966: 28-29).

Finishing with gritstones produced the rounded forms distinctive of native wood carving (my underlining, Boas 1966: 31).

The Yuquot abrasive materials, mostly of feldspathic greywacke (Muller 1979), were brought to the midden. According to a respondent, greywacke was collected and quarried on the east side of Nootka Sound.

Slabs were apparently separated from the sedimentary formations with large yew wood wedges. The pragmatic Nootkans likely also collected large fragments that had eroded from the formations.

The first step in studying the abraders was to separate actual abrader artifacts from probable collected, but naturally worn, unused abrasive material. Examination of weathered greywacke pieces in the field revealed a consistently uniform surface without striae. Obvious abraders examined by touch and under 10 X magnification in oblique light in a darkened room showed surfaces with uneven textures, often with light, but regular striae which indicate direction of abrasion. Surfaces used considerably may appear impacted and even shiny with few well-defined striae. Between the two extremes of natural and altered textures there are obviously specimens difficult to identify as either natural or used material. Such problematic specimens were rejected as artifacts. A total of 1526 artifacts was identified as abraders, with the following zonal breakdown: Zone I, 121; Zone II, 548; Zone III, 487; Zone IV, 260; without provenience, 110. The special properties of abraders required slightly different classification principles.

Classification of abraders. Most artifact classifications are based on static attributes of shape which remain relatively constant during and after use of the artifact. This allows recognition of certain artifact types or fragments thereof. For example, valve fragments of composite salmon harpoon heads can be recognized as taking biconical arming points or wedge-based arming points, because the proportions of the spur size on the valve to the contact surface are not altered from use of the artifact.

In the case of abraders, however, the nature and extent of use may alter the shape of the abrader considerably. A classification of abraders should reflect the inconstant nature of abrader attributes. The classification should take into account as much as possible variables that determine abrader shape and size: (1) abrasive material; (2) initial shaping of abrader, if any; (3) kinds of materials abraded: shell, stone, bone, antler, wood, tooth; (4) shapes of surfaces abraded; (5) sizes of surfaces abraded; (6) extent of use of abrader; (7) reuse of fragments or whole abraders; and (8) motor habits of the users. It is difficult to account for all these variables, because many abraders were used or reused in various ways and the shape and size resulting from previous shaping and grinding are altered. This is especially evident on most Yuquot abraders. It is common to see extensive striae overlain by more recent ones formed by grinding in a different direction or at a different surface angle. Fragments of once large abraders have been reused on freshly broken edges. Many apparently "complete" or intact abraders, those worn on all surfaces, are obviously irregular fragments of once larger shaped abraders. Abrasive saws are all thin fragments of once larger abraders. The nippled abraders are thin fragments with sharp-angled corners. Some greywacke pieces containing piddock burrows, which may have made them suitable for use as fishing sinkers, show evidence of former use as abraders.

The problems of abrader classification are further complicated by the fragmentary condition of most abraders. Only 317 abraders, or approximately 21 per cent of a total of 1526, were found to be complete, either used on all surfaces or with intact shape attributes made by use. Most abraders are body fragments, corner fragments and end fragments too small or too broken for inference of complete dimensions and wear patterns of once larger, more regularly shaped specimens. Therefore, this report deals at length with only the more complete or intact patterned specimens and any unusual specimens. Even so, classification in most instances is essentially one of end fragments, rather than of intact or nearly intact artifacts. Such fragments seldom approach the estimated original dimensions of the artifacts, but do at least suggest intact shapes and sizes, and possible uses.

The abraders have been organized into two major groups: (1) shaped abraders, which appear to have been formed into rectanguloid plaques whose shape has been more or less retained despite use; and (2) unshaped abraders, fragments of shaped abraders and of fragments, whose shape has been more or less formed through use. These two major groups are then subdivided into shapes that likely had specific uses. Such shapes are in turn separated according to lithic materials that may have pertained to use. The enormous quantity of abraders made geological identification of each one unfeasible; therefore, most were assigned lithic types from comparison with identified specimens (Muller 1979; Donaldson 1970; M. Turay, personal communication). The classification scheme is outlined as follows:

Abraders		
Shaped (moreso from manufacture)		
	Rectangular:	greywacke mudstone siltstone basaltic tuff and other hard stones
	Prisms:	basaltic tuff and other hard stones siltstone
Unshaped (moreso a result of use)		
	Plane:	greywacke
	Bar:	greywacke
	Grooved:	greywacke mudstone
	Concave:	greywacke mudstone
	Nippled:	greywacke
	Cone:	greywacke
	Saws:	greywacke schist slate dacite tuff

Shaped abraders. Shaped abraders have a deliberately manufactured form altered relatively slightly by use. Judging from several specimens, shaping was accomplished by pecking and battering the stone into the approximate desired shape and size. The rough surfaces were then smoothed. Whether this was done by means of another abrader, by use or by a combination of both, is not clear. Intact shaped abraders have straight sides and somewhat angular corners or edges - attributes present on some uncompleted specimens that bear evidence of shaping. The most common shape is invariably rectangular or rectanguloid in various materials: greywacke, mudstone, siltstone, basaltic tuff and other hard stones. Small rectanguloid prisms appear to be another manufactured shape. Only two examples of these, however, were recovered.

Rectangular abraders of greywacke. One hundred twenty-four rectangular abraders of feldspathic greywacke (Figs. 26-28; Table 8)

Table 8. Rectangular Abraders of Greywacke: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Zone/Stratum	Artifact No.	Length	Width	Thickness
IVe	[illegible]	59*	41	12	IIa	[illegible]	176*	114	11
IVd	[illegible]	88*	87	13	IIa	[illegible]	93*	123	11
IVd	[illegible]	132*	169	21	IIa	[illegible]	215*	106	16
IVd	[illegible]	39*	60	10	IIa	[illegible]	62*	49	9
IVb	[illegible]	117	93	11	IIa	[illegible]	133*	74	26
IVb	[illegible]	144*	106	13	IIa	[illegible]	80*	121	16
IVb	[illegible]	77*	91	20	IIa	[illegible]	Frag.*	-	6
IVb	[illegible]	238	86	24	IIa	[illegible]	57*	21	10
IVb	[illegible]	190	72	20	IIa	[illegible]	113*	142	20
IVb	[illegible]	59*	66	10	IIa	[illegible]	92*	48	11
IVb	[illegible]	113*	91	19	IIa	[illegible]	51*	76	13
IVb	[illegible]	88*	72	22	IIa	[illegible]	64*	140	31
IVb	[illegible]	153*	135	19	IIa	[illegible]	110*	69	19
IVb	[illegible]	99*	72	18	IIa	[illegible]	140*	128	17
IVb	[illegible]	55*	51	16	IIa	[illegible]	113*	79	13
IVb	[illegible]	160*	113	37	IIa	[illegible]	111*	77	11
IVb	[illegible]	87*	48	14	IIa	[illegible]	77*	55	18
IVa	[illegible]	128*	120	13	IIa	[illegible]	68	37	16
IVa	[illegible]	112*	173	16	IIa	[illegible]	112*	78	11
IVa	[illegible]	56*	72	12	IIa	[illegible]	114*	113	16
IVa	[illegible]	67*	50	13	IIa	[illegible]	73*	57	12
IVa	[illegible]	94	63	9	IIa	[illegible]	156*	121	12
					IIa	[illegible]	137*	113	11
IIId	[illegible]	128*	106	22	IIa	[illegible]	172*	140	80
IIId	[illegible]	87*	68	21	IIa	[illegible]	97*	117	21
IIId	[illegible]	63*	66	10	IIa	[illegible]	132	63	26
IIIc	[illegible]	98*	87	21	IIa	[illegible]	108*	80	17
IIIc	[illegible]	93*	66	13	IIa	[illegible]	63*	69	18
IIIc	[illegible]	233	111	28	IIa	[illegible]	76*	92	18
IIIc	[illegible]	77*	88	17	IIa	[illegible]	221	97	29
IIIc	[illegible]	61*	80	9	IIa	[illegible]	56*	75	16
IIIc	[illegible]	51*	43	11	IIa	[illegible]	72*	77	19
IIIc	[illegible]	62*	87	22	IIa	[illegible]	88	60	14
IIIc	[illegible]	70*	55	10	IIb	[illegible]	119*	43	14
IIIc	[illegible]	167*	127	41	IIb	[illegible]	93	42	11
IIIb	[illegible]	70*	92	11	IIb	[illegible]	80*	93	20
IIIb	[illegible]	100*	80	16	IIb	[illegible]	113*	102	21
IIIb	[illegible]	168	66	10	Ib	[illegible]	240	103	22
IIIb	[illegible]	172	160	26	Ib	[illegible]	137*	67	20
IIIb	[illegible]	163	55	17	Ib	[illegible]	75*	100	22
IIIb	[illegible]	73*	106	19	Ib	[illegible]	67*	86	23
IIIb	[illegible]	59*	66	13	Ib	[illegible]	87*	117	18
IIIb	[illegible]	67*	78	16	Ib	[illegible]	101*	101	11
IIIb	[illegible]	163	80	12	Ib	[illegible]	80*	57	15
IIIb	[illegible]	108*	126	20	Ib	[illegible]	138	76	16
IIIb	[illegible]	53*	76	16	Ib	[illegible]	51*	40	10
IIIb	[illegible]	98*	111	16	Ib	[illegible]	63*	86	12
IIIb	[illegible]	133*	120	17					
IIIb	[illegible]	100*	123	11	No provenience	[illegible]	114*	48	21
IIIb	[illegible]	87	68	17		[illegible]	129*	111	28
IIIb	[illegible]	118	88	20		[illegible]	102*	66	16
IIIb	[illegible]	85	66	16		[illegible]	102	48	15
						[illegible]	96*	101	13
IIa	[illegible]	120*	138	13		[illegible]	48*	78	14
IIa	[illegible]	110*	66	11		[illegible]	106*	108	16
IIa	[illegible]	171*	152*	15		[illegible]	110*	87	15
IIa	[illegible]	120	108	13		[illegible]	163*	111	16
IIa	[illegible]	170*	85	28		[illegible]	74*	68	23
IIa	[illegible]	207*	160	17		[illegible]	106*	95	12
IIa	[illegible]	171*	182	28		[illegible]	95*	102	18
IIa	[illegible]	160	67	13		[illegible]	128	56	18
IIa	[illegible]	103*	81	26		[illegible]	172*	103	23
IIa	[illegible]	107*	112	15		[illegible]	320*	112	21
IIa	[illegible]	85*	113	16					

were recovered from all four stratigraphic zones. The outline is rectangular or rectanguloid with square or rounded corners and straight sides. The sides are flat or slightly convex vertically; some may slope inwardly more on one face than on the other. Cross sections are rectanguloid or rectangular. Although both faces are usually worn, one face is often more worn than the other. The heavily worn face is often flat both lengthwise and transversely. Occasionally the more worn face will be slightly concave.

The rectangular greywacke abraders vary considerably in size. Dimensions (Table 8) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	69-372	50.39	79.67	23
width	30-183	89.57	33.5	122
thickness	6-37	16.85	5.55	124

Correlations of lengths, widths and thicknesses do not reveal apparent size clusters. However, within the wide range of dimensions there was likely some kind of size-use specialization.

The larger abraders (Fig. 26c,d,h,i,l; Fig. 27c-i) have inconsistent wear patterns on the faces; small depressions and irregularly worn areas are common. This suggests that the abraders were not pushed about on surfaces to any extent, but rather that objects with surfaces smaller than the abrader were ground against it.

The smaller abraders, less than 150 mm long, can fit comfortably in the hand. Perhaps for this reason more care seems to have been given to their shaping (Fig. 28a,b,d-i). Sides are often straight, with edges relatively sharp. One fragmentary specimen (Fig. 28b) has beveled edges on one side and a biconical perforation, presumably for suspenision. The upper faces of some extremely worn specimens are nearly flat and so compacted from wear that it is difficult to determine striae. Less, but still well-worn specimens have striae oriented predominantly lengthwise, with finer striae entering from the sides. The upper faces of 20 small abraders are worn slightly concavely in long section, or cross section or both. This suggests that small objects were ground or polished mostly on one face of these artifacts. The small abraders may have been used for touching up small surfaces, perhaps as whetstones. These abraders may be the "coarse flat whetstone" used for sharpening iron tools (Cook 1785, Vol. 2: 330).

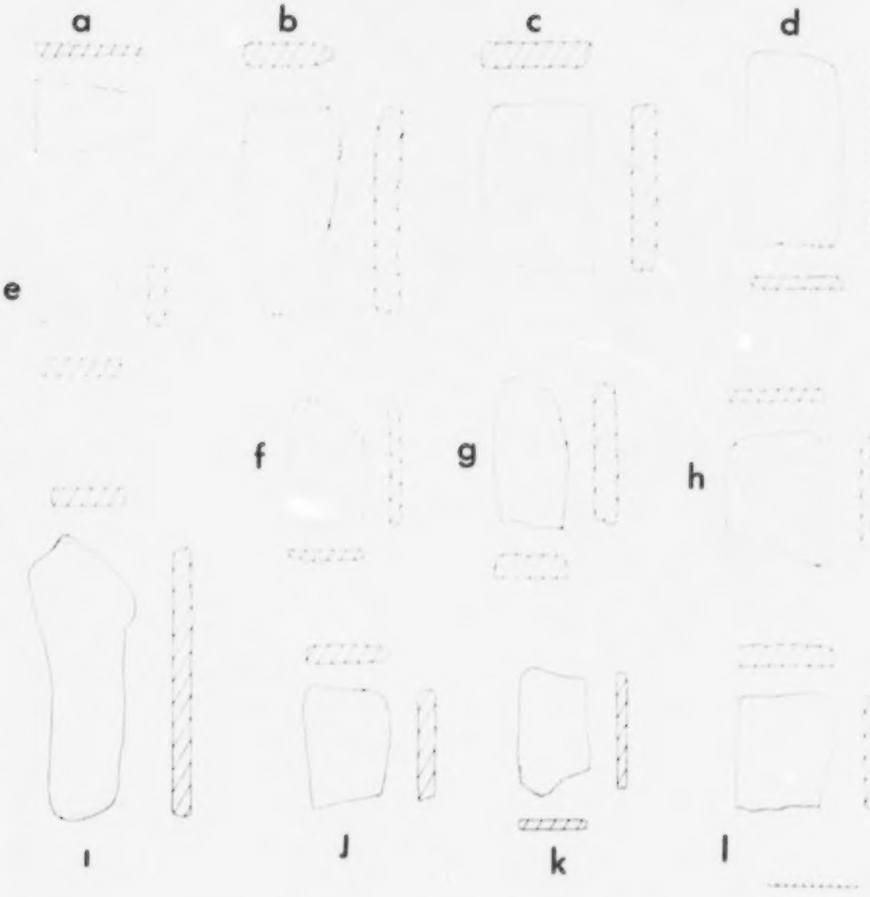


Figure 26. Rectangular abraders of greywacke: a, 1T2E15-5264x from Zone IIa; b, 1T3B15-4445x from Zone IIIc; c, 1T2F6B-3989x from Zone IIIc; d, 1T2E20-3665x from Zone IIa; e, 1T2K14B-4797x from Zone II; f, 1T1E16-3870x from Zone IIa; g, 1T1B23B-4272x from Zone IIa; h, 1T2H19B-4515x from Zone IIa; i, 1T1X1-5081; j, 1T2C27-4954x from Zone IIa; k, 1T2K7-3638x from Zone IIIb; l, 1T1K-4781. (Scale: 0-10 cm.)

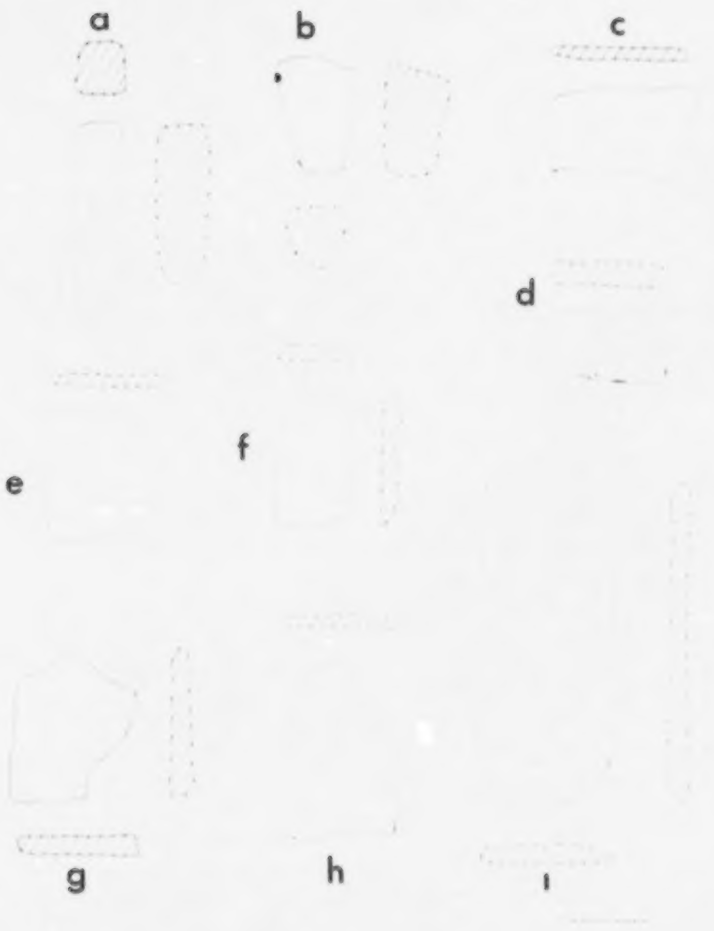


Figure 27. Abraders of greywacke. Bar abraders: a, 1T1A25A-3636x from Zone IIa; b, 1T2F18A-3614x from Zone IIa. Rectangular abraders: c, 1T3A3A-4785x from Zone IVa; d, 1T2G22A-4460x from Zone IIa; e, 1T1L4A-4240x from Zone IVb; f, 1T2K14A-3659x from Zone IIa; g, 1T2J18B-4782x from Zone IIa; h, 1T3C19A-4448x from Zone IIa; i, 1T1G11A-3637x from Zone IIIb. (Scale: 0-10cm.)

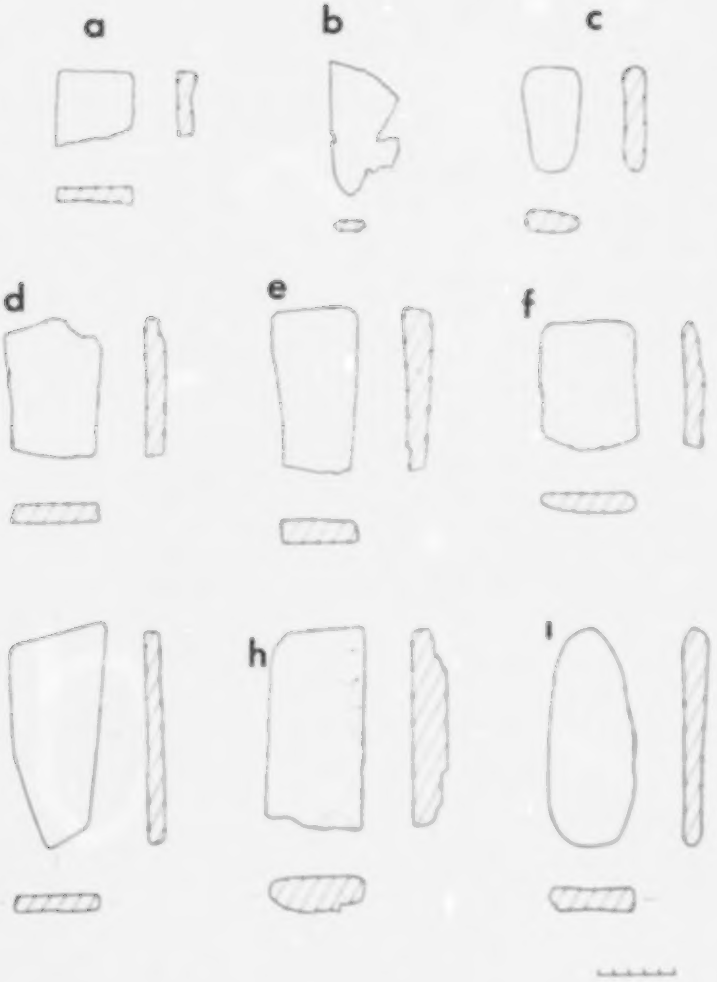


Figure 28. Small rectangular abraders of greywacke: a, 1T1M2A-3615x from Zone IVb; b, 1T2F24-3299x from Zone IIa; c, 1T1H19B-4995x from Zone IIa; d, 1T2J17B-4590x from Zone IIb; e, 1T1X1-5055x; f, 1T1M8B-3731x from Zone IIIb; g, 1T2G11A-3601x from Zone IIIb; h, 1T1L9B-3697x from Zone IIa; i, 1T1H10-1535 from Zone IIIb. (Scale: 0-5 cm.)

Rectangular abraders of mudstone. Six rectangular abraders of mudstone and 11 of calcareous mudstone (Fig. 29c-g) were recovered from Zones II, III and IV. Attributes and dimensions are similar to those of the small greywacke rectangular abraders. Three artifacts are hollow ground on one face.

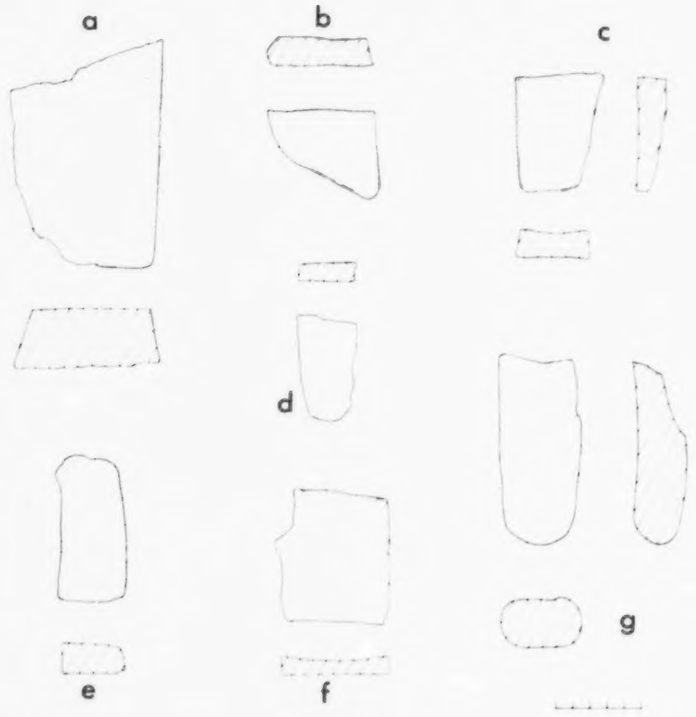


Figure 29. Rectangular abraders of mudstone and basalt. Basalt: a, 1T2G24A-2767 from Zone Ib. Basaltic tuff: b, 1T2C15-774x from Zone IIIc. Calcareous mudstone: c, 1T1X1-737; d, 1T1X1-3324; e, 1T1G4-4252x from Zone IVd; f, 1T1H20B-3623x from Zone IIb; g, 1T2C20A-1133 from Zone IIa. (Scale: 0-5 cm.)

Table 9. Rectangular Abraders of Mudstone: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVa	1T1A4B-248	59+	42	17
IVa	1T1E5A-4327x	62+	-*	10
IIIc	1T2A12-3871x	104+	57	24
IIIb	1T1M7-3540x	79	49	8
IIa	1T1G19-5026x	60+	-*	24
IIb	1T2H17B-3627x	86+	123	17

*Incomplete.

Table 10. Rectangular Abraders of Calcareous Mudstone: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Fig. No.
IVd	1T1G4-4252x	87	39	21	29e
IVb	1T1M2B-4004x	73+	39	11	
IVb	1T1M3-3869x	76+	58+	8	
IIa	1T1A19-5103x	66+	74	10	
IIa	1T2B20-3606x	42+	48	16	
IIa	1T2C20A-1133	112+	48	30	29g
IIa	1T2D21-2685x	frag.		20	
IIa	1T1H20B-3623x	67+	77+	12	29f
II	1T1J13-4513x	51+	57	20	
no provenience	1T1X1-737	67	51	18	29c
	1T1X1-3324	59+	35	12	29d

The mudstone abraders are too fragmentary for a meaningful summary of dimensions (Table 9). Dimensions of the calcareous mudstone abraders (Table 10) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	67-87	77.0	14.14	2
width	35-74	48.9	6.43	8
thickness	8-30	16.18	1.94	11

Mudstone appears to be too soft to be effective as an abrader by itself, but it does contain quartz and feldspar grains that would be suitable for polishing (Donaldson 1970). Perhaps the mudstone abraders were used with oil for fine sharpening.

Rectangular abraders of siltstone. Thirty-one rectangular abraders, from Zones II, III and IV have been identified as various siltstones: tuffaceous siltstone, calcareous siltstone, argillaceous siltstone and, generally, siltstone (Donaldson 1970; Turay, personal communication). The total includes two abraders of unidentified material believed to be forms of siltstone (Fig. 30).

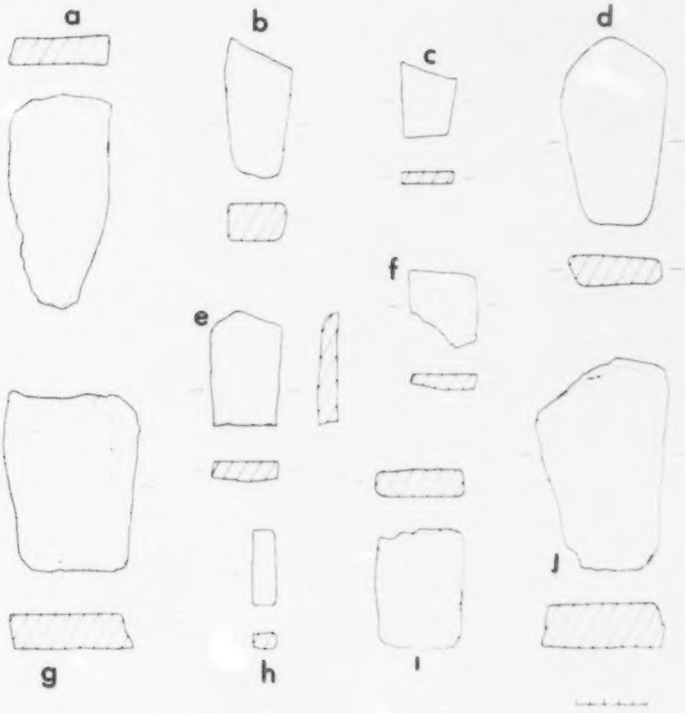


Figure 30. Abraders of siltstone. Small rectangular abraders of siltstone: c, 1T2A18-3680x from Zone IIa; f, 1T3A12A-4370x from Zone IIIc. Small rectangular abraders of tuffaceous siltstone: a, 1T1X1-3658; g, 1T1X1-4051x; j, 1T2G7C-4804x from Zone IVc. Small rectangular abraders of calcareous siltstone: b, 1T1C20A-4583x from Zone IIa; d, 1T1H19A-2640 from Zone IIb; e, 1T1J22B-4549x from Zone IIa. Small rectangular abraders of argillaceous siltstone: i, 1T2E18-3625x from Zone IIa. Siltstone prism: h, 1T2H9-4039x from Zone IIIb. (Scale: 0-5 cm.)

Table 11. Rectangular Abraders of Calcareous Siltstone: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Fig. No.
IVc	1T1H6B-3958x	110	46	20	
IIa	1T1C20A-4583x	95	47	28	30b
IIa	1T1J22B-4549x	81+	49	13	30e
IIb	1T1H19A-2640	131	75	22	30d
IIb	1T1K11A-3592x	99+	67	25	

The five calcareous siltstone abraders (Fig. 30b,d,e; Table 11) are similar in shape and dimensions to the small greywacke rectangular abraders. Dimensions (Table 11) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	95-131	112.0	18.08	3
width	46-75	56.8	13.31	5
thickness	13-28	21.6	5.68	5

The calcareous siltstone is very soft and strongly resembles mudstone. Both calcareous siltstone and mudstone abraders may have had the same or similar uses.

Table 12. Rectangular Abraders of Tuffaceous Siltstone: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Fig. No.
IVc	1T2G7C-4804x	146	90	33	30j
IVb	1T2H6-1856x	102+	64	23	
IIIb	1T1J6-3604x	93+	51	9	
IIa	1T2C21-1913x	76+	62	23	
IIa	1T2G20-3972x	72	66	14	
IIa	1T2J9-2068	68+	59	12	
no provenience	1T1X1-3634	140	65	35	
	1T1X1-3658	152	72	23	30a
	1T1X1-4051	125	91	30	30g

The nine rectangular tuffaceous siltstone abraders (Fig. 30a,g,j; Table 12) also resemble the greywacke and mudstone rectangular abraders in shape and size. Dimensions (Table 12) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	72-152	127.00	32.34	5
width	51-91	68.89	13.49	9
thickness	9-35	22.44	9.28	9

The tuffaceous siltstone is noticeably harder and finer grained than the calcareous siltstone. The tuffaceous siltstone, however, is rich in the excellent abrasive grains of quartz and feldspar (Donaldson 1970). Three small abraders are slightly hollow ground on one face. The good abrasive grains, hollow ground surfaces and small size suggest use as a whetstone or oilstone.

Three rectangular abraders of argillaceous siltstone (Fig. 30i) are also quite hard and extremely fine grained. All are carefully shaped and small sized (in mm):

Zone/Stratum	Artifact No.	Length	Width	Thickness
IIIc	1T2B11-3662x	62+	64	24
IIIb	1T1G11A-3647x	103+	59	17
IIa	1T2E18-3625x	85	62	20

All three have been used on both faces, which are worn flat, except for one face which is worn slightly concave. This dense material may have required water or oil to abrade effectively, and suggests use as a whetstone or oilstone.

Table 13. Rectangular Abraders of Siltstone: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Fig. No.
IVc	1T2F5A-3597x	frag.	-*	-*	
IVb	1T2H4-4022x	frag.	-*	12	
IIIc	1T1A16B-3641x	frag.	-*	9	
IIIc	1T3A12A-4370x	54+	48	12	30f
IIIc	1T1C13A-852	frag.	-*	10	
IIIc	1T1E13-2301	frag.	-*	11	
IIIb	1T1M7-1996	frag.	-*	10	
IIa	1T2A18-3680x	54+	40	9	30c
IIa	1T1E19-3598x	97	42	20	
IIa	1T2E17-3330x	frag.	-*	10	
IIa	1T1F14C-3603x	72+	60	14	
IIa	1T2H18B-4309x	56+	63	19	
IIa	1T2L11-3587x	80+	54	10	
IIa	1T1N7-1978	frag.	-*	-*	

*No data.

The 14 rectangular abraders identified only generally as siltstone (Fig. 30c,f; Table 13) vary noticeably in hardness and probably include different kinds of siltstone. Four soft abraders show different wear: two are slightly convex on one face, and two are hollow ground longitudinally on one or both faces. The five hard abraders are fragmentary; three are worn flat on both faces; one is hollow ground on one face and one is longitudinally hollow ground on both faces. These hard abraders may have served as whetstones or oilstones. Three of the siltstone artifacts may be abraders in the shaping process. Two have been sawed on opposite faces. An abrader believed to be siltstone appears to have been shaped by chipping on one side and is ground flat on one surface. Dimensions of the 14 siltstone abraders (Table 13) are too incomplete for a meaningful summary.

Rectangular abraders of basaltic tuff and other hard stones. Nine rectangular abraders are very hard fine-grained stones: basaltic tuff, dacite tuff, basalt, limestone and amphibolite (Fig. 29a,b; Table 14). These artifacts were recovered from Zones I, II and III. Dimensions (Table 14) are too incomplete for a meaningful summary.

The extreme hardness of these small abraders suggests a sharpening use as whetstones or oilstones. Some of these artifacts, as well as the hard siltstone abraders, could fit this rare description of Nootkan whetstones in 1789:

> Besides the Rocks that constitutes [sic] the Mountains and the Shores there, a Black one like the Oil Stone of Carpenters & one of a dirty pea Green colour both which they polish for working tools and war weapons ... (Colnett 1940)

Table 14. Rectangular Abraders of Basaltic Tuff and Other Hard Stones: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Material*	Fig. No.
IIIc	1T2C15-774x	-**	63	18	BTA	29b
IIIb	1T1J5-5263x	frag.	-**	12	A	
IIa	1T2A17-3670x	frag.	-**	20	L	
IIa	1T2F14A-2323	frag.	-**	-**	BA	
IIa	1T1G13-1945	141	70	38	DTF	
IIa	1T1G16-2263x	frag.	-**	-**	BA	
IIb	1T1J11-3596x	134	47	33	BTF	
Ib	1T2G24A-2767	132	90	36	BPF	29a
Ib	1T1J20B-3591x	71	46+	14	BTA	

* Identified by Donaldson (1970) and Muller (1979).
** Incomplete.

Small prisms. Two unusual artifacts are essentially small rectanguloid prisms. Their shape and size are distinct from the other shaped abraders, thus suggesting the possibility of different use.

One artifact, from Zone IIIb, is soft siltstone (Donaldson 1970). It is rectangular with rounded corners in both outline and side view (Fig. 30h). The faces, sides and ends are worn nearly flat, with a slight convexity on one side. The artifact is 54 mm long, 17 mm wide and 12 mm thick This siltstone appears too soft for abrading but likely contains enough hard grains for fine polishing.

The other prism, from Zone IIId, is of fine-grained basalt (Muller 1979). In outline it is roughly rectangular with slightly biconcave-waisted sides and rounded ends (Fig. 31). In side view and long section the artifact is rectangular with rounded ends. Both faces are nearly flat, whereas the sides are roughly beveled, so that they are slightly rounded in cross section. The artifact is 63 mm long, 9 mm thick, 15.5 mm wide in the middle and 18.5 mm wide at the ends. The surfaces are covered with many striae and scratches, but these appear to have resulted from shaping the artifact, rather than from using it. The denseness and smoothness of the artifact suggest use as a whetstone.

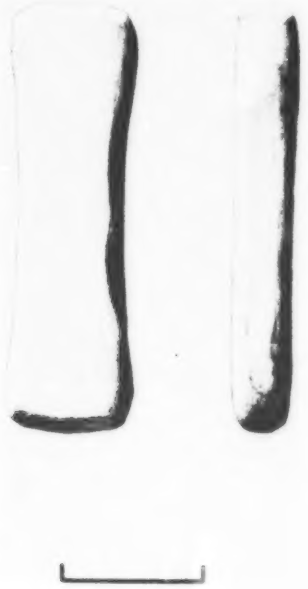


Figure 31. Fine-grained basalt prism from Zone IIId (1T3C9-409). (Scale: 0-2 cm.)

Unshaped abraders. Unshaped abraders include abraders whose shape is considered to be largely a result of use. Most are fragments of either the shaped rectangular abraders or other unshaped abraders, and they may exhibit some shaped surfaces. These, however, seem to have little relevance to the use (or re-use) of the artifact and therefore are ignored as attributes. Six basic shapes resulting largely from use have been distinguished: plane, bar, grooved, concave, nippled, cone and saws.

In addition, there are 1022 abrader fragments, mostly greywacke, which lack sufficient attributes to be classified as either shaped or unshaped abraders, but bear greatest affinities to the plane abraders. The fragments, if worn on all surfaces, would be classified as plane abraders. Zonal distribution of the fragments is as follows: Zone I, 74; Zone II, 350; Zone III, 335; Zone IV, 196; and without provenience, 67.

Plane abraders. Plane abraders are the most abundant type of abrader. A total of 241 complete specimens, those worn on all surfaces, were recovered as follows: Zone I, 31; Zone II, 96; Zone III, 79; Zone IV, 24; and no provenience, 11.

The complete plane abraders (Fig. 32) are mostly used fragments of greywacke rectangular abraders or simply fragments of abrasive stone used without appreciable recognizable shaping or modification before use. Consequently, plane abraders vary considerably in outline, including irregular, asymmetrical specimens with bumpy edges and projections; roughly triangular pieces; oval, pebble-like pieces; and rectanguloid pieces. Sides are usually curved with rounded edges where the face and side meet. Face wear also varies considerably: from very rough, to smooth but bumpy, to flat. Cross section and long section, however, are usually rectanguloid.

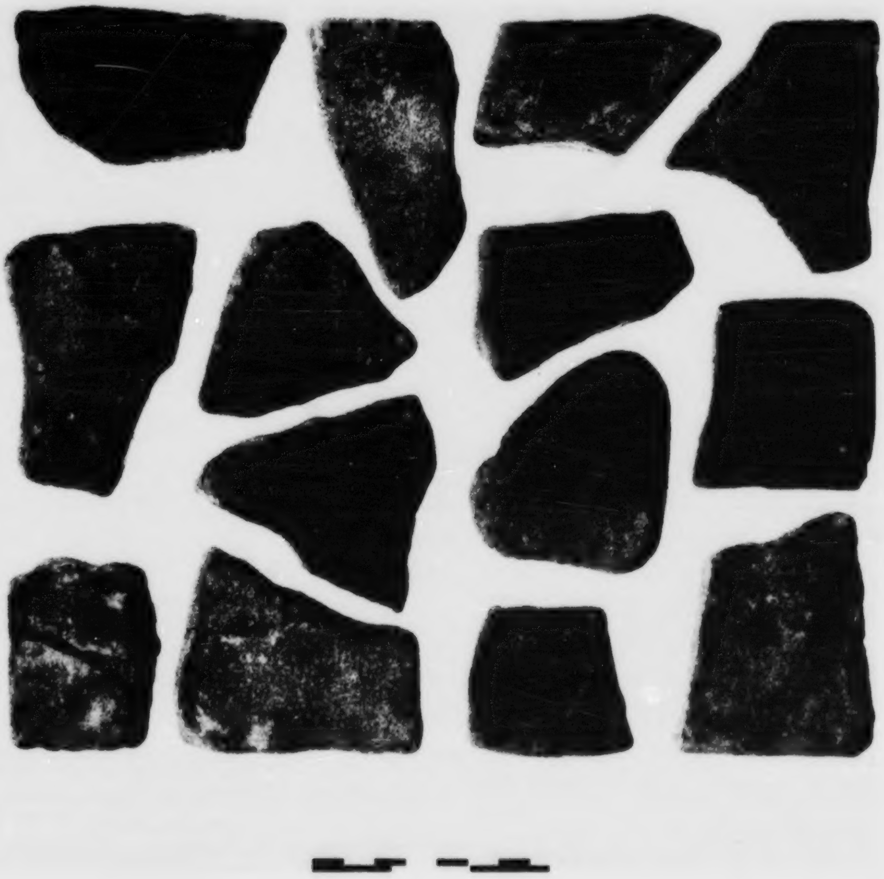


Figure 32. Plane abraders. (Scale: cm, in.)

Size is also irregular and appears to form no consistent clusters or patterns. A summary of maximum dimensions gives some notion of sizes:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	47-210	91.05	26.04	241
width	37-145	65.37	18.23	241
thickness	6-29	13-50	4.35	241

Despite the great variation in size and shape, the plane abraders appear to have a common wear pattern. Striae on the faces occur at several angles to one another. The edges between the face and side are rounded. This wear pattern would probably have formed from using the abraders primarily as planing blocks, probably much in the same way we use small pieces of sandpaper held around a block of wood. Some specimens also bear concentrations of striae in one direction on a limited area of the face, which would have been produced from abrading surfaces smaller than the abrader. However, edge wear and the majority of striae suggest that the artifacts were used primarily for planing. These abraders fit the ethnographical description of a primary tool in the Nootkan carpenter's kit, "small flattish slabs" of sandstone for finishing (Drucker 1951: 77, 79).

Bar abraders. Eleven abraders from Zones IIa and III are long, thick prismatic bars of stone (Fig. 27a,b; Table 15). Both the cross section and long section are rectanguloid, with rounded corners and edges, except for one trapezoidal example (Fig. 27b). Dimensions (Table 15) are summarized as follows:

Table 15. Bar Abraders: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Material	Fig. No.
IIIc	1T1B13-5020x	183	57	25	greywacke	
IIIc	1T1D14-4543x	97	49	35	calcareous mudstone	
IIIc	1T2E7-3953x	207	74	32	greywacke	
IIIb	1T2G11-1539	186	35	21	greywacke	
IIIb	1T2K6-1732	158	54	26	greywacke	
IIa	1T1A25A-3636x	188	61	57	greywacke	27a
IIa	1T2E14A-5267x	141	58	49	greywacke	
IIa	1T2F18A-3614x	137	82	87	greywacke	27b
IIa	1T2F23-5387x	153	70	40	mudstone	
IIa	1T1H12-4068x	+ 75	55	28	greywacke	
IIa	1T2H10-2221	189	49	23	greywacke	

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	97-207	163.9	33.00	10
width	35-82	58.6	13.03	11
thickness	21-87	38.5	19.63	11

Nine abraders are of medium-grained feldspathic greywacke, 1 of mudstone and 1 of calcareous mudstone.

The abraders are worn on all surfaces. Striae run mainly lengthwise, but striae at sharp angles from the sides are also visible.

The heaviness, bar shape, rounded edges and varied striae of the greywacke abraders suggest use as rasps, whereas the soft mudstone bars may have served as heavy polishers.

Grooved abraders. Thirty-six abrader fragments (Figs. 33, 34; Table 16) from all four stratigraphic zones bear appreciable grooves which suggest specialized uses. One fragment may have up to five grooves. The grooves range in shape and size from scratches to poorly defined wide grooves.

The smallest grooves are really concentrations of scratches less than 1 mm wide and less than 70 mm long on flat or slightly concave

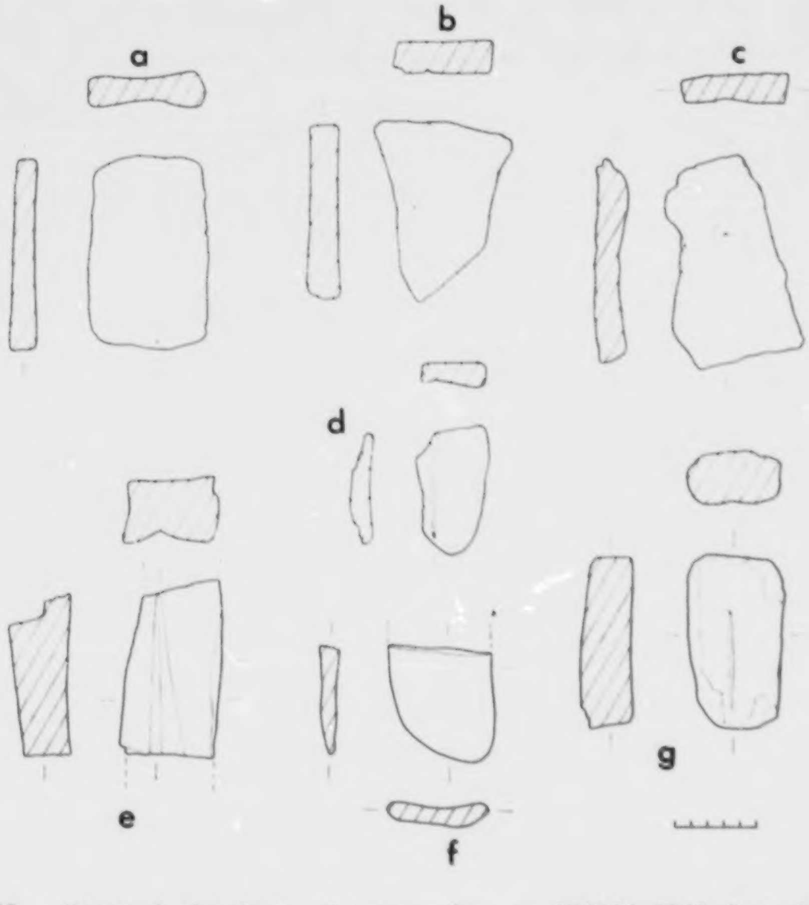


Figure 33. Grooved abraders of greywacke: a, 1T1G16-2265 from Zone IIa; b, 1T2C20-1132 from Zone IIa; c, 1T1B17-791 from Zone IIIc; d, 1T1C30-3672x from Zone Ib; e, 1T2A9-633 from Zone IIId; f, 1T1J14-3649x from Zone II; g, 1T2C7-579 from Zone IVa. (Scale: 0-5 cm.)

surfaces. Similar scratches sometimes found in depressions or very shallow grooves suggest that the concentrations of scratches may be the early stages of a groove. Only four specimens have concentrations of scratches: from Zone II, 1T2G22A-4354x, 1T1H19A-4899x; Zone IIIc, 1T3B11-4314x; and Zone IVb, 1T2L2A-3528x.

Table 16. Grooved Abraders: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Groove Length	Groove Width	Groove Depth	Body Length	Body Width	Body Thickness	Fig. No.
IVd	1T1B1-492	87	7	2.0				
		34+	1	1.0				
IVb	1T2L3/8-1937	34+	4	1.5	66+	72	21	
IVa	1T2C7-579	55	2	1.0	106	58	33	33g
IIId	1T2A9-633	93	12	4.0	107+	60	41	33e
IIIc	1T3A12A-4380x	64+	6	1.5				
		33+	5	1.5				
IIIc	1T1B17-791	87	24	3.0	73+	122	20	33c
IIIc	1T1C14A-868	38+	7	4.0				34
		30+	7	3.0				
IIIb	1T2B7-1781	43+	2	1.0	87+	59+	21	
IIa	1T2A15A-4144x	34+	7	4.0				
IIa	1T2A17-3628x	60+	6	1.5	111+	147+	18	
IIa	1T3A18A-3607x	37+	2	1.0				
IIa	1T3B17-803x	50+	8	3.0				
		39+	6	0.5				
		61+	8	1.5				
IIa	1T3B19-961x	43+	12	1.5				33b
IIa	1T2C20-1132x	101	4	2.0				
IIa	1T1G10-3390x	25	3	1.5				
IIa	1T1F16-2139	70+	10	3.0	91	74+	29	
		60+	9	2.0				
IIa	1T3G10-2265	118	26	4.0	119	74	21	33a
IIa	1T2G14A-2037	70+	12	4.0	82+	106	26	
		77+	12	4.0				
IIa	1T2B15A-2276	150+	13	3.0	192+	155	39	
		177+	15	9.0				
		107+	13	2.5				
		150+	12	4.0				
		163+	18	7.0				
IIa	1T1J14-3649x	47+	41	3.0	69+	62	13	33f
IIa	1T2K9-4389x	32	3	1.0				
		36	3	0.5				
IIa	1T2K10A-2533	85+	20	1.0	99+	57	21	
IIa	1T2L11-3620x	62+	9	3.0	105+	117	36	
IIb	1T2B17B-3443x	74+	15	1.5	80+	138	14	
Ib	1T1C30-3672x	81	3	1.0				33d
no provenience	1T1X1-3321	111+	12	5.0	165+	96	36	
		105+	8	2.5				
	1T1X1-3322	110+	43	4.0				
	1T1X1-3323	89	12	4.0				
	1T1X1-3588x	68	6	3.0	88+	91+	20	
	1T1X1-3638	80	3	1.0				
		74	4	1.0				
		60	2	0.5				
		50	2	0.5				
	1T1X1-3703	59+	8	1.5				
		63+	8	1.0				
		53+	5	1.0				
	1T1X1-5051	89	4	0.5				

Most grooves, however, are regular and well defined (Fig. 33a,b,d,e,g). In outline, the sides of the more intact grooves converge in shallow, pointed ends. Long sections are slightly concave. Cross sections are from V- to U-shaped. Dimensions (Table 16) of 45 regular grooves are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	25-101	68.0	22.16	15
width	1-18	7.3	4.27	45
depth	0.5-9	2.3	1.76	45

Five artifacts have a poorly defined groove with vague or irregular sides (Fig. 33 c,f). They vary in width from 20 to 43 mm (Table 33).

The grooved abraders are of medium-grained feldspathic greywacke, except for one specimen (Fig. 34) of soft calcareous siltstone (Donaldson 1970), which was perhaps more suitable for polishing than abrading.

The surfaces of the grooves are striated in a lengthwise direction. The pointed ends of the grooves, concave long sections and narrowness of the grooves indicate that the objects abraded were pointed and shorter than the groove. A longer, blunt object such as an arrow shaft, would probably produce a groove with more parallel sides and wide ends. The only artifacts that are narrow, pointed and smaller than the grooves are bone points and awls.

Grooved abraders were probably more common than the 36 examples discussed here would suggest. Traces of grooves were observed on several plane abrader fragments and re-used fragments. Any appreciable groove weakens the tabular-like abraders, making them prone to fracture along the grooves.

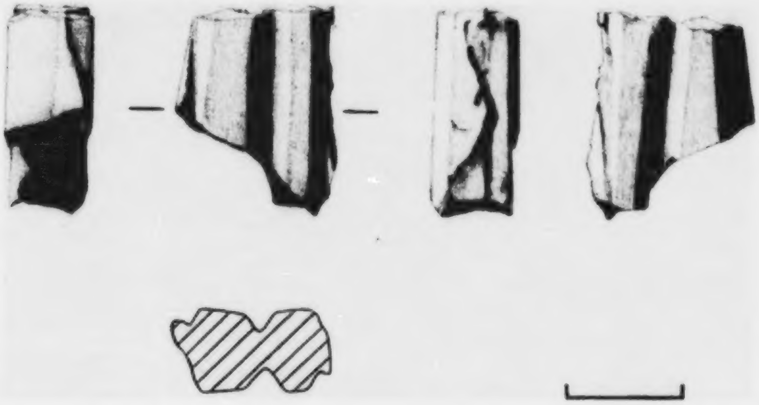


Figure 34. Grooved abrader of calcareous siltstone from Zone IIIc (1T1C16A-868). (Scale: 0-2 cm.)

Concave abraders. Seven abrader fragments or reused fragments of feldspathic greywacke from Zones II, III and IV bear deeply worn concave depressions (Fig. 35; Table 17). The more intact specimens suggest that the depressions were more or less elliptical or oval in outline. In some instances they were worn into the face of a rectangular abrader which subsequently fractured in the weakened thinned areas (Fig. 35a,c). Other specimens appear to be reused fragments worn on the face and side (Fig. 35b,d,f). Dimensions of concavities (Table 17) are too incomplete for a meaningful summary.

Wear striae in the depressions are strongest in a lengthwise direction; one specimen has a slight groove worn in the concavity (Fig. 35e). However, striae oriented at different angles to one another are also present in the depressions. This wear pattern suggests that objects were abraded with a circular or elliptical motion. This, in turn, would suggest sharpening or smoothing, perhaps as a whetstone.

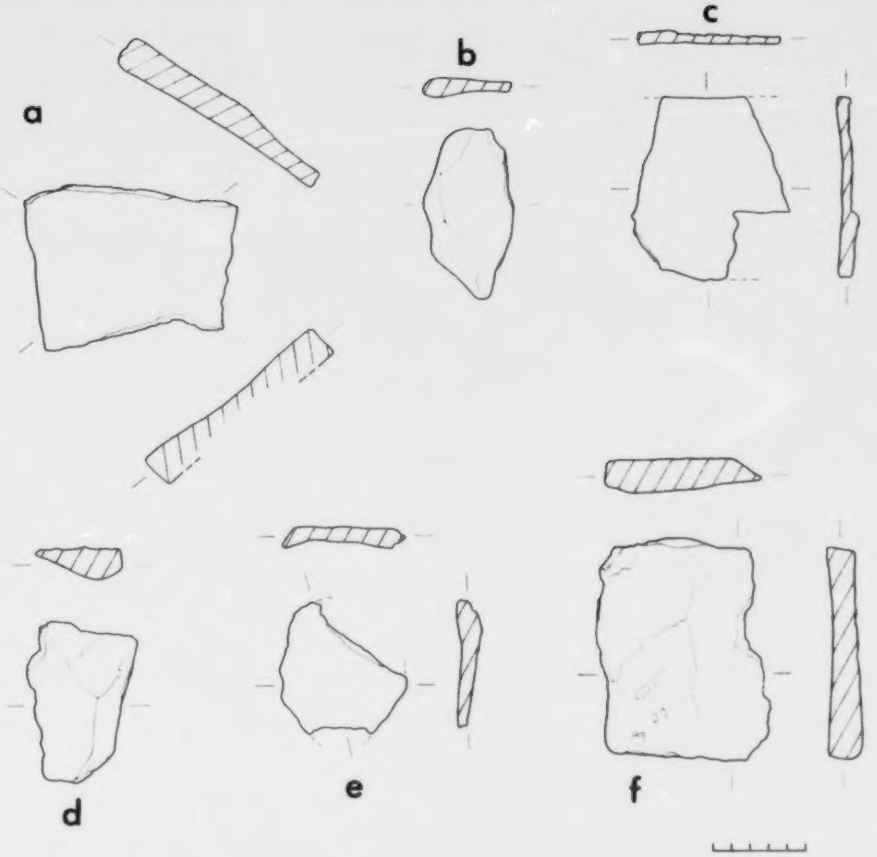


Figure 35. Concave abraders of greywacke: a, 1T3A16A-3719x from Zone IIa; b, 1T1E5A-4679x from Zone IVa; c, 1T2H15B-4398x from Zone IIb; d, 1T1G12B-3617x from Zone IIIb; e, 1T1N7-4110x from Zone IIa; f, 1T1B16A-4986x from Zone IIIc. (Scale: 0-5 cm.)

Table 17. Concave Abraders: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Depth	Fig. No.
IVa	1T1B4-3660x	85	46	13	
IVa	1T1E5A-4679x	81	38	3	35b
IIIc	1T1B16A-4986x	106	34	6	35f
IIIb	1T1G12B-3617x	85+	33+	2	35d
IIa	1T3A16-3719x	113+	66	5	35a
		110+	44+	8	
IIa	1T1N7-4110x	56+	56+	5	35e
IIb	1T2H15B-4398x	95+	77+	4	35c

Concave abraders were likely more abundant than the small number here would indicate. Nearly all the abraders have broken in their concavities, the thinnest and weakest part of the artifact. Many such broken concave abraders were likely re-used or fractured into shapes that could not be recognized.

Cone abraders. Three fragmentary abraders of feldspathic greywacke from Zones IIIb and IVa have a distinctive cone-like shape. In outline the sides taper at an angle of 15° or less to a rounded tip (Figs. 36, 37). The cross section of the smallest abrader is round (Fig. 37), whereas the other two have oval cross sections. One of the abraders has lost its tip; however, the sides and corners leading to it are round and tapering, thus indicating a probable cone-like shape. All three abraders are relatively small:

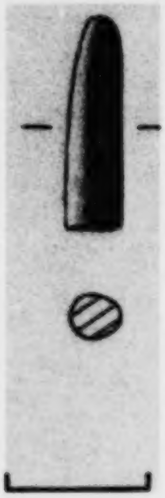


Figure 36. Cone abrader of feldspathic greywacke from Zone IIIb (1T2K7-1795). (Scale: 0-2 cm.)

Zone/Stratum	Artifact No.	Maximum Width (mm)	Maximum Thickness (mm)
IVa	1T1C4A-174	20.0	15
IIIb	1T1H8-3621x	28.5	15
IIIb	1T2K7-1795	8.5	8

Lengths of all three are incomplete.

Patterns of striae are difficult to detect on these artifacts. On the smallest artifact some traces of transverse-oriented depressions suggest a twisting or turning of the artifact. The general shape with rounded ends, rounded edges and narrow taper suggests that the artifacts could have been used for finishing open sockets or grooves such as those found on valves of composite harpoon heads. The cone-like abraders have a shape and size similar to the valve sockets and also occur in the same time period.

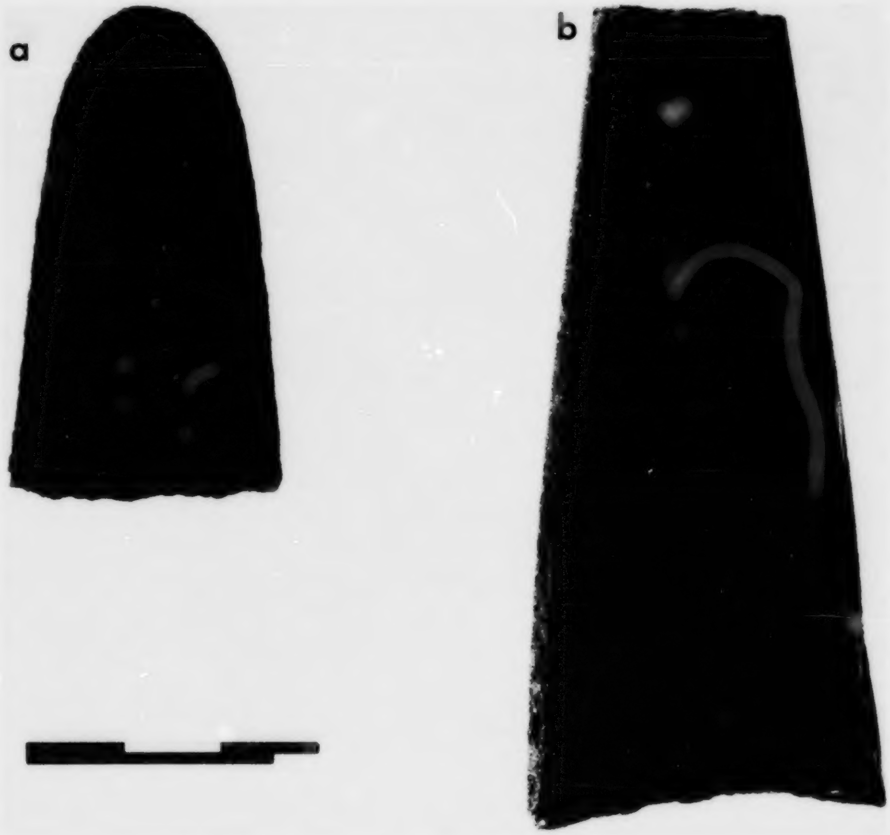


Figure 37. Cone abraders of greywacke: a, 1T1H8-3621x from Zone IIIb; b, 1T1C4A-174 from Zone IVa. (Scale: cm, in.)

Nippled abraders. The end of one complete abrader and one corner on three thin abrader fragments have been worn into a slightly asymmetrical nipple-like shape (Fig. 38). The "nipples" range in height from 6 to 17 mm, with base widths of 11 to 21 mm, and base thicknesses of 9 to 12 mm (Table 18). All the abraders are feldspathic greywacke.

No striae running from the tip of the nipple to the base could be detected. Numerous horizontal striae ring the nipples, however, and indicate the limits of wear and manner of use. The nipple shape and base widths indicate that this part of the abrader was forced against a small enclosing conical surface with a diameter of less than 17 mm. The horizontal rings and striae show that the abrader was turned or twisted against the enclosing surface. The corners of the abrader fragments appear thin and angular enough to have been used without deliberate modification of the corner before use. Bevels near the base of the "nipple" on the complete abrader (Fig. 38a), however, suggest that this end of the abrader was made thinner before use.

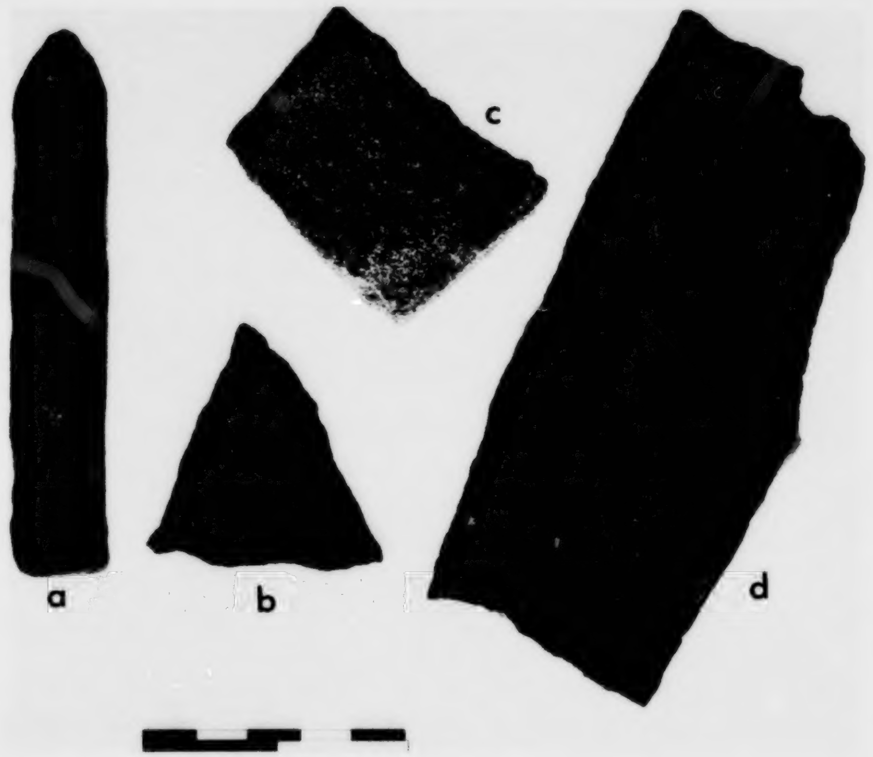


Figure 38. Nippled abraders of greywacke: a, 1T1G23-2557 from Zone IIa; b, 1T2A9-3976 from Zone IIId; c, 1T3B16-4645x from Zone IIIc; d, 1T2B18-3609 from Zone IIa. (Scale: cm, in.)

Table 18. Nippled Abraders: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Nipple Height	Nipple Base Width	Nipple Base Thickness	Fig. No.
IIId	1T2A9-3976x	17	21	10	38b
IIIc	1T3B16-4645x	6	11	9	38c
IIa	1T2B18-3609x	6	11	9	38d
IIa	1T1G23-2557	15	16	12	38a

Conical or reverse nipple-like surfaces are found in the line holes of large male harpoon heads and the perforations of pendants and needles. The nippled abraders were likely used to enlarge and finish biconical perforations on such bone and wooden objects.

Although only four nippled abraders were recovered from Zones IIa and IIIcd; such abraders were likely more common in the Nootkan tool kit than this sample would suggest. The thin, fragile corners would wear down quickly or break easily and thus be lost to the archaeological record.

Abrasive saws. Twenty-four thin-edged fragments of abraders (Figs. 39, 40; Table 19), mostly of feldspathic greywacke, have been used as saws. They were recovered from all four stratigraphic zones.

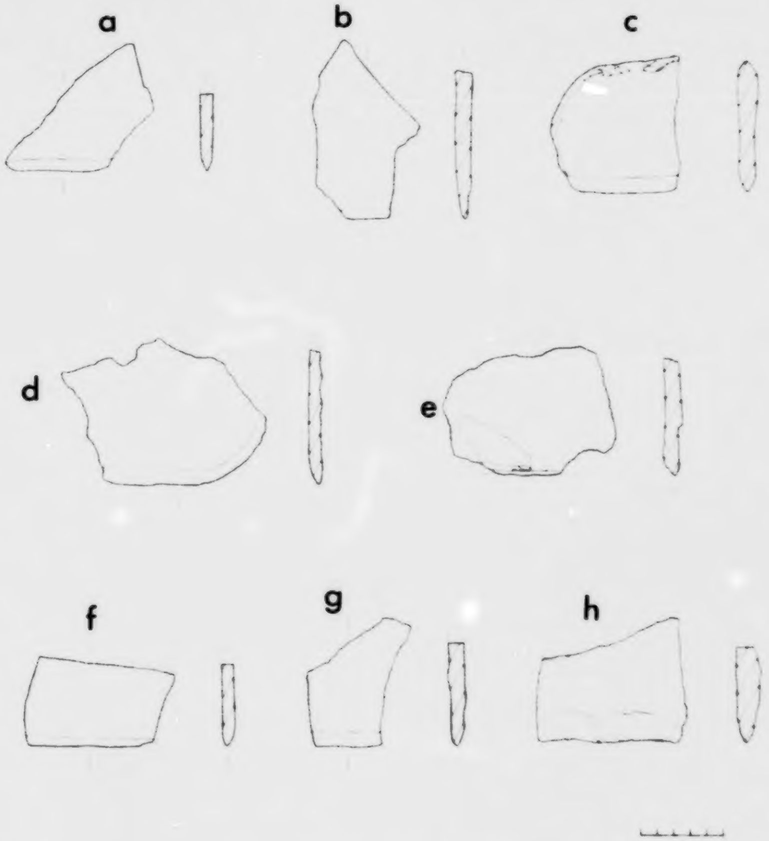


Figure 39. Abrasive saws: a, 1T1F11-1972 from Zone IIIc; b, 1T2D12-3694x from Zone IIIc; c, 1T2A4-4263x from Zone IVa; d, 1T1B22A-3878x from Zone IIa; e, 1T2G24A-4160x from Zone Ib; f, 1T1X1-5082; g, 1T1G23-3619x from Zone IIa; h, 1T2B21-4128x from Zone IIa. (Scale: 0-5 cm.)

Like other abraders, the shape of the saws is largely a result of wear. The saws have a thin, straight, blade-like edge formed by the meeting of two bevels parallel to the blade edge. The width of each bevel, measured from the edge of the blade to the edge of the saw face, remains more or less constant for the blade length. Only two saws, 1T2D13-3679x and 1T1X1-5082, have irregular bevels, wide at one end of the blade and narrow at the other; the wide end of one bevel and narrow end of the opposing bevel are at the same end of the blade. This wear pattern may have been produced by holding the saw diagonally to the wear groove when in use. Blade cross sections vary somewhat. Nine are symmetrical with the widths and angles of both bevels being equal or almost equal. Thirteen blade cross sections are asymmetrical, formed of one wide bevel at a shallow angle to the saw face with a shorter opposing bevel at a sharp angle to the other face. This wear pattern may have been generated by holding the saw slightly to one side in the saw groove, instead of in a more or less vertical position which likely produced the symmetrical cross section. Only three saws have complete blades, recognized as a straight blade with slight upturning and corner wear at both ends. The body above the blade is irregularly shaped.

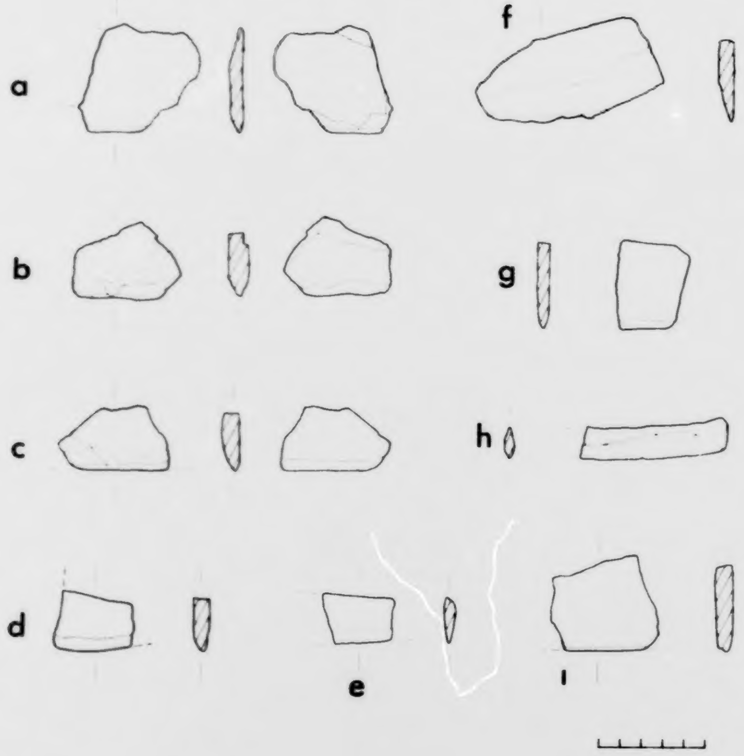


Figure 40. Abrasive saws: a, 1T1X1-5088x; b, 1T2H9-4096x from Zone IIIb; c, 1T1X1-3552; d, 1T1N8-5087x from Zone Ib; e, 1T1H6B-3407x from Zone IVc; f, 1T2D14B-3643x from Zone IIIc; g, 1T1X1-3317; h, 1T3B16-5083x from Zone IIIc; i, 1T1E17-4733x from Zone IIa. (Scale: 0-5 cm.)

Regular surfaces found there were likely made from prior use as an abrader.

This is confirmed by wear patterns above the blade. All the faces are well worn, and in several instances, the sides as well. On most saws the wear pattern produced on the blade from sawing has altered dissimilar wear patterns near the blade, thus indicating that the artifacts had other uses before sawing. Such previous wear patterns appear on abraders. The saws, therefore, were utilized thin abrader fragments ranging from 16 to 5 mm thick (inferred from body thickness of the saws), with a preference for fragments between 10 and 4 mm thick. Apart from blade shape, there appears to be no well-defined or intentionally fashioned overall shape for the saws, which suggests that they were not hafted but held directly in the hand.

Table 19. Abrasive Saws: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Body Thickness	Blade Thickness	Blade Length	Blade Bevel Symmetrical	Widths on X-Section	Blade Bevel Asymmetrical	Widths on X-Section	Fig. No.
IVc	1T1H6B-3407x	6	5	28+	7	none			40e
IVa	1T2A4-4263x	13	11	65+			10	8	39c
IIIc	1T1B14-2822x	5	4	53	3	3			
IIIc	1T3B16-5083x	5	5	68+	7	3			40h
IIIc	1T1C10-374x	8	6	20+	11	10			
IIIc	1T2D8-3711	5	5	38+	3	2			
IIIc	1T2D12-3694x	12	5	27+			6	4	39b
IIIc	1T2D13-3679x	7	5	40+			5-11	3-5	
IIIc	1T1F11-1972	9	7	63+	8	8			39a
IIIb	1T2H9-4096x	9	9	41+			8	5	40b
IIIb	1T1M6-3539x	5	5	37+	8	8			
IIIa	1T3C17B-5091x	7	3	58+	3	none	3	none	
IIa	1T1B22A-3878x	9	7	63+			9	8	39d
IIa	1T2B21-4128x	16	10	86+			11	6	39h
IIa	1T1D19-2954x	6	5	23+	6	5			
IIa	1T1G23-3619x	11	6	41+	4	4			39g
Ib	1T3A28B-5085x	5	4	56+			8	6	
Ib	1T2G24A-4160x	12	10	49+			9	7	39e
Ib	1T1N8-5087x	8	7	36+			6	4	40d
no provenience	1T1X1-3317	6	5	27+	3	3			40g
	1T1X1-3324	9	6	73+	9	10			
	1T1X1-3552	8	8	48+			11	4	40c
	1T1X1-5028	8	8	75+			5-10	4-6	39f
	1T1X1-5088x	7	7	27+			8	3	40a

Dimensions of the saws (Table 19) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
body thickness	5-16	8.17	2.9	24
blade thickness	3-11	6.4	2.08	24
blade bevel widths, symmetrical x-sections	2-11	5.79	2.95	19
blade bevel widths, asym. x-section	3-11	6.66	2.54	29

In early stages of use, the saws probably resembled a large abrader fragment worn only along the edge and projecting surfaces of the rough sloping broken side (Fig. 39h). Considerable sawing would form two bevels on the rough surfaces, and the blade edge would straighten, so that the cutting surfaces of the saw would eventually resemble those of "mature" specimens (Fig. 39c,e,f).

Like most abraders, the saws are medium-grained feldspathic greywacke. Six saws were so identified (Muller 1979); 15 other saws, not identified, are obviously of the same material. One saw (Fig. 40h) appears to be a schistose rock. Another, 1T3C17B-5091x, was identified as medium-grained dacite tuff (Donaldson 1970); the dacite would contain materials hard enough to abrade. A knife-like saw of slate (Donaldson 1970), 1T1X1-3324, also contains effective abrasive materials.

The properties of feldspathic greywacke, essential for the function of other abraders, are just as important for the stone saws. Greywacke is a soft sedimentary material in which a high percentage of quartz grains is embedded (Muller 1979). The hard quartz grains served as a grinding component. As the saws were drawn back and forth against a surface, quartz grains that became blunted or dislodged when the softer matrix around them wore away would be replaced by other quartz grains in the new surface. It has been suggested that sawing with such stone was probably possible by adding water to the saw groove to wash away ground material and to keep worn particles from clogging the abrasive surfaces of the saw (Semenov 1964: 71).

The bevels of saw blades, and frequently the body of the saw adjacent to the bevels, bear striae which run parallel to the edge of the saw blade. The direction of the striae indicates that the artifacts were moved back and forth within a groove or against a similar confining surface.

Evidence of sawing stone in this manner can be readily found on the grooved parts of the stone fish-hook shanks. Fine parallel striae present in the point beds and lashing grooves of the stone shanks indicate a sawing action with an abrasive material. The cutting edges of many of the saws recovered are fine enough to fit into the grooves of the stone shanks. Two worked pieces of basaltic tuff and one of dacite tuff indicate that small artifacts of soft stone were roughed out by sawing opposing grooves 2-4 mm deep on both faces of the stone and then snapping off the stone along the groove. The resulting rough surface from the break between the grooves was then abraded smooth. Saw grooves on bone artifacts such as harpoon valves, fish-hook barbs and a club handle indicate that the above described technique was also used for working bone.

Celts

The term "celt" refers here to artifacts that were likely the bits of either adzes or chisels, but whose use cannot be definitely determined. A total of 43 such artifacts made from various stones, shell and bone was recovered. Despite this variety of materials, essentially four shapes of celts were manufactured: narrow celts, broad celts, bone adzes or gouges and shell celts. Although these shapes change over time, they remain relatively constant through all four stratigraphic zones.

In view of this constancy, the types of celts known ethnographically are reviewed to identify shapes and uses. One problem here, of course, is that European and Nootkan tool categorizations are not necessarily the same, and similarly categorized tools may have additional or different uses in native culture. Nevertheless, the review does provide some linkage of ethnographical types with archaeological ones, and some clues regarding use.

The celts were also examined at some length for wear patterns. Although evidence of wear patterns was observed, it was of limited success in inferring use.

Adzes and chisels in ethnographical literature and collections.

During the early contact period at Nootka Sound, Europeans observed that cutting tools used in woodworking consisted of shell knives (Moziño 1970: 44) and chisels with bits of iron, bone and stone (Cook 1785, Vol. I: 330; Strange 1928: 51). Ethnographers later distinguished three kinds of related tools used in woodworking: chisels, straight adzes and D-adzes.

Chisels historically were iron blades hafted in open beds in straight, short yew handles. Drucker's Nootkan respondents thought that bone blades or small stone celts were used formerly as chisel bits (Drucker 1951: 78). Stone bits were used in chisels at Clayoquot Sound (Koppert 1930: 38). No chisels with stone bits appear to have been collected. A complete chisel with a bone bit (BCPM Cat. No. 2241) was collected from Barkley Sound. The chisel, which is perhaps a model, has a thin, straight-edged bone blade 47 mm wide by 9 mm thick lashed into a slotted straight wooden handle 406 mm long by 35 mm in diameter.

The straight adze, which looked like a chisel with a short, slightly curved handle, apparently went out of use early in the historic period (Drucker 1951: 78). Such a tool may be the specimen from the Webber collection, illustrated by Henking (1957: 368). Another probable example was collected by Newcombe, who described it as a "knife" (BCPM Cat. No. 2242). It has a thin excurvate metal blade 29 mm wide lashed to a long curved yew handle. The complete adze is 312 mm long.

The D-adze has a distinctive yew wood or whalebone handle resembling the letter "D" (Force and Force 1968: 153). An indented end on the lower flat side of the handle served as an open bed to which the bit was lashed with hide or sinew strips and kept firm by small wedges driven between the bit and handle. In the late 19th and early 20th centuries, reworked files and unmodified axe heads lashed sideways to the handle were used as bits. Drucker's respondents thought that in ancient times adze bits were made from shells or were "small flattish stone celts" (Drucker 1951: 78). The latter are well described for Clayoquot Sound:

> the black stone out of which the blade is made is ground down until it is only two and one-half inches long, and one and three-quarters of an inch wide. It is three-quarters of an inch thick in the center, gently thinning out the cutting edge, where it is about five-eighths of an inch

> thick, with rounded corners. The opposite end has a flat edge half an inch thick; this part fits securely against the handle butt...(Koppert 1930: 36).

Although it is fairly clear from the above discussion that chisels, straight adzes and D-adzes were in use at Nootka Sound from an undetermined time before first contact with Europeans and on into the historic period, possibly similar, but other woodworking tools, perhaps gouges, were also used but were unrecorded. The bits from at least some of the known woodworking tools were likely among the celts recovered from the excavation. Considerable effort was made to recognize significant attributes of the celts and to infer use of the artifacts.

Examination of celts for attributes of use. Most of the ethnographical data summarized earlier for chisels and adzes are too imprecise to allow identification of the tool from the bit alone. In an attempt to infer uses of the celts, they were shown to respondents, studied for shape and examined for wear patterns. This left many unanswered questions, but also provided some functional clues.

Respondents could not distinguish specific uses for the differently shaped celts and surmised that the artifacts could have been chisel bits, adze bits or wedges. Such inconsistent responses are not surprising, because stone and bone woodworking tools have not been in the Nootkan experience for generations and are now known only from folk memory.

The blade shape of celts does not necessarily indicate use. Chisel blades may be either symmetrical or asymmetrical in profile; adze blades, often deemed asymmetrical in profile, can be either symmetrical or asymmetrical in profile, and either straight or convex along the cutting edge (Semenov 1964: 21, 126-131). As noted earlier, Nootkans in the historic period lashed symmetrically bladed commercial axeheads sideways to D-adze handles. There is no reason to doubt that Nootkan stone adze bits could also have been symmetrical in profile. Consideration of artifact shape together with wear patterns provides more attributes for classification and evidence for direct inference of use.

To distinguish wear patterns, the stone celts were studied on two separate occasions according to the techniques and principles described by Semenov (1964). Before the first examination, the celts were immersed in acetone to remove dust, oil, fingerprints and perspiration salts. Undiluted xylene, which does not remove numbers, was used to clean the artifacts for the second examination. After removal from the cleaning solutions, the artifacts were left to dry. Striae are very difficult to distinguish on celts of highly reflective light grey or white stone. These were painted with a dilute solution of methyl blue and water until an adequate density of stain was attained for a specific artifact. (Methyl blue stain reacts chemically with the surface of stone and bone and cannot be removed without damaging the artifact.) The celts were then examined under a binocular microscope at magnifications from 15 to 90 times. The most useful magnifications for distinguishing patterns of striae ranged between 25 and 50 times. The light source, a single narrow beam that could be regulated in intensity, was independent of the microscope and easily moveable. In the second examination, a single polarizing filter was used to diffuse the light slightly. During both examinations the room was darkened so that no overhead or natural light was present. The light beam was directed at a shallow angle of about 10 - 30° onto the surfaces of the artifacts. The artifacts were held firm with a moveable clamp or propped up with plasticine on a moveable stage. The latter arrangement provided more control. The lower halves of the celts, particularly the cutting edge and surfaces near the blade, were scrutinized under several magnifications, angles and light intensities.

Although the wear patterns and respective uses that Semenov distinguished in his studies and experiments are likely produced on artifacts and inferred correctly, the wear patterns that he illustrates (Semenov 1964: figs. 63, 64) were not found on the Yuquot celts. Semenov does not describe the range and variations of wear patterns in his sample, and the specimens which he illustrates probably represent ideal examples. Furthermore, many factors, some discussed by Semenov (1964: 11-15), determine the formation, alteration and identification of wear patterns. Several of these factors apply particularly to the Yuquot celts and reduce the possibilities of finding examples like those described by Semenov.

The pattern of wear and its intensity on the celts varies according to use and stone type. Hard stones would have to be used more than soft ones to develop a well-defined pattern of striae. Celts of vesicular stone are less likely to develop well-defined patterns of striae because surfaces around the vesicles fracture more easily during use than a wholly consistent surface. Stones containing crystals or bodies of a different material than the surrounding matrix wore irregularly, especially if the matrix and contained bodies had different degrees of hardness and different fracture planes. The materials worked with the celts probably affected the wear pattern produced. The presence of grit, sand, water, etc. on the tool and materials worked would also likely influence the wear pattern. Motor habits required for specific tasks and idiosyncrasies of individual users are also factors influencing wear patterns.

The amount of use obviously determines intensity of wear and affects the chances of well-defined wear striae remaining on the celts. The more a tool is used, the more it must be sharpened. Sharpening alters and removes wear striae. The longer a tool is used, the greater the chance of blade fracture, which also removes striae. The possibility that celts were turned over and rehafted when one face became too worn or fractured should not be discounted. Finally, after celts have been lost or discarded, patinas may form and obscure wear patterns that may be present.

Of 27 stone celts examined under the microscope, eight lacked enough blade for determination of wear patterns. Two celts with nearly complete blades (Figs. 46, 57) were covered with fine reddish brown patinas which hid any striae present. The patinas could not be dissolved chemically. The other 17 celts with complete or partial blades showed striae at vertical, diagonal and more or less horizontal angles to the blade. Comparison of these striae with those on poll or side bevels formed by abrading suggests that most blade striae were also made by abrading, probably from sharpening. One incomplete artifact

(Fig. 242) exhibits many sharpening and polishing striae, but virtually no wear on the edge or faces, which suggests that it is not a celt but some other tool, perhaps the celt-like arming point of a weapon (cf. Gunther 1972: figs. 11-18). Only two celts (Figs. 65, 66) had well-defined patterns of striae that appear to have resulted from use rather than sharpening. These patterns are described in the section on broad celts.

Although well-defined patterns of wear striae were not detected on the other 14 celts, examination did determine the extent of relative wear on the blades. Every celt, including the two with well-defined wear patterns, was worn unequally on the blade faces; one face was more worn or damaged than the other. The less-damaged and more intact face on 13 of 16 celts bore more evidence of sharpening, indicated by striae diagonal or horizontal to the blade edge. Appreciable differences in the numbers of such striae on both faces could not be determined on two artifacts (Figs. 55, 59); one artifact (Fig. 58), although worn unevenly, bore no striae.

The implications of this general wear pattern for inferring the use of the celts are unclear. One face worn more than the other would indicate use as adzes according to Semenov (1964: 21, 126-133). Unfortunately, Semenov does not discuss the attributes of chisel wear. If Nootkan chisels were used in the same manner as European chisels, one face might receive more wear than the other, but presumably such wear would occur closer to the blade edge on chisels than on adzes. In any case, this assumption is of little value in identifying the Yuquot celts, because striae produced by wear on the upper parts of the blades are difficult to distinguish from those made by sharpening or shaping. Relative blade size indicated by size of blade bevels may reflect relative closeness of wear to the blade edge.

Two very distinct shapes of stone celts, with corresponding differences in the size of blade bevels, are apparent in the sample: narrow celts and broad celts.

Narrow celts. Twenty-two celts are proportionately long, narrow and thick (Figs. 41-56; Tables 20, 21). Blade length is roughly one-third to one-half of the artifact length. The narrow celts are found in all four stratigraphic zones. The early specimens tend to have round polls, few side bevels and no, or poorly defined, shoulders. This shape changes over time to well-defined shoulders with sides and faces tapering to a flat poll. Well-defined and more numerous bevels tend to characterize the late specimens. As a descriptive convenience the narrow celts are grouped into round polled celts and flat polled celts. Despite the differences in shape, however, the proportions of both groups remain the same. The dimension summaries for both groups are remarkably similar. Therefore, variation in shape over time appears to be a stylistic change in one artifact type, rather than the development of a new type or two partly contemporary types.

Round-polled narrow celts. The round-polled narrow celts (Figs. 41-48; Table 20) were found in Zone Ib and the lower levels of Zone IIa. These celts are topped by a round poll which gradually expands into the faces and sides. The sides are generally ground into two bevels which meet in the middle of the side, forming a ridge from the poll to the blade. The faces and sides in outline and profile are slightly convex, with widest and thickest dimensions reached at or near the middle of the celt. The lower portions of the faces tend to be ground flat because they are ground down to form the blade. Only four specimens have relatively intact blades. These are straight in both outline and end view and nearly symmetrical in profile. Small bevels from 4 to 7 mm wide form the cutting edge. One bevel is less worn than the other and bears more horizontal and oblique sharpening striae than the other. The opposite bevel is more worn or damaged from use. Wear and sharpening on both bevels are very close to the cutting edge. The closeness of wear to the cutting edge suggests less movement of the tool, which may indicate that the narrow celts were used as chisels.

Table 20. Round Polled Celts: Proveniences, Dimensions (mm) and Materials

Zone/Stratum	Artifact No.	Length	Maximum Width	Maximum Thickness	Blade Length	Poll Width	Poll Thickness	Material*	Fig. No.
IIa	1T1C27-1579x	79+	37	20	incom.	30	13	BTM	45
IIa	1T2C23-1171	72	32	14	20	30	13	BTA	46
Ib	1T2B33A-2776x	-**	48	28	-**	-**	24	BF	41
Ib	1T1G26-2578	70+	34	19	-**	23	12	BA	42
Ib	1T1H22A-2768	62	29	16	24	26	14	BGF	43
Ib	1T2H22-2482	71	30	18	25	23	13	BTM	44
no provenience	1T1X1-3318	72	34	18	20	30	18	BF	47

* Identified by Muller (1979).
** Incomplete.

Dimensions of the round-polled celts (Table 20) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	62-72	69.25	4.86	4
width	29-48	34.86	6.39	7
thickness	14-28	19.00	4.43	7
blade length	20-25	22.25	2.63	4
poll width	23-30	27.00	3.46	6
poll thickness	12-24	15.29	4.31	7

Included in the above is a fragmentary specimen of special interest because of its size and provenience at the base of Zone Ib. The artifact is a heavily patinated upper portion of a round-polled celt (Fig. 41). One face has been ground flat, while the other is naturally convex. A bevel has been ground on each side bordering the flattened face. Other surfaces of the sides appear pecked and partially ground. The fractured end is waterworn. The proportions of this artifact are double those of the other round-polled celts. Possibly this artifact represents an earlier or larger variety of the round-polled celts.

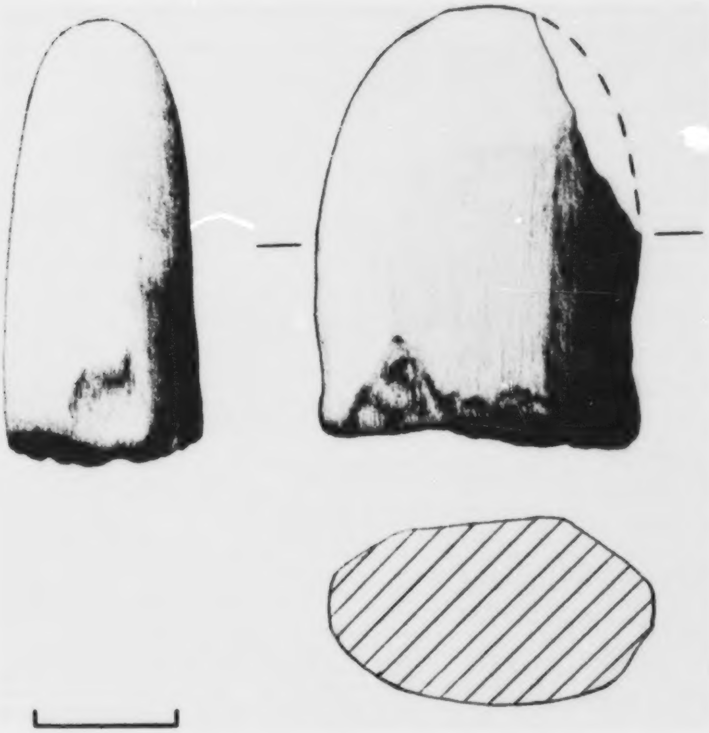


Figure 41. Waterworn fragment of round-polled narrow celt from Zone Ib (1T2B33A-2776x). (Scale for Figs. 41-66: 0-2 cm.)

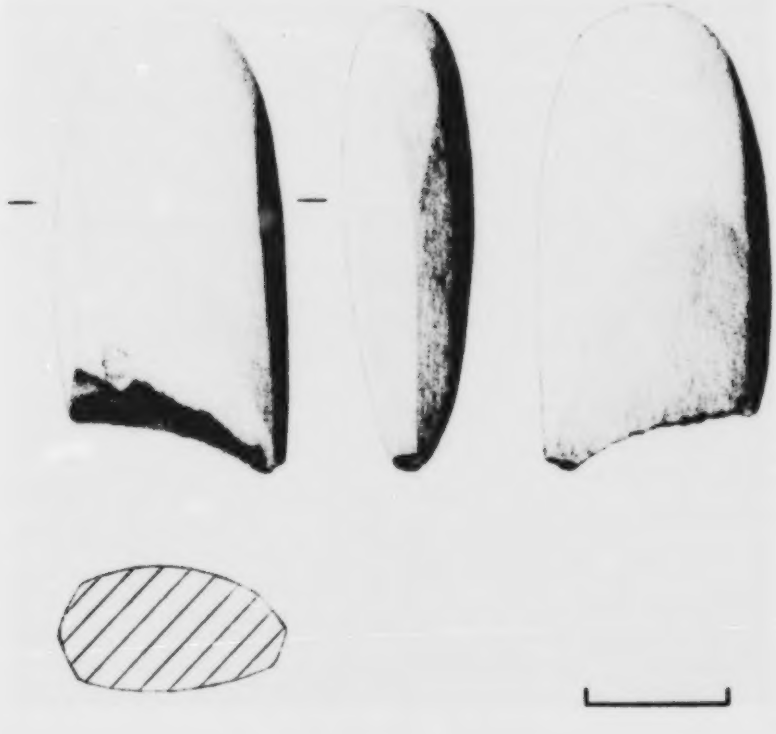


Figure 42. Fragmentary round-polled narrow celt from Zone Ib (1T1G24-2578).

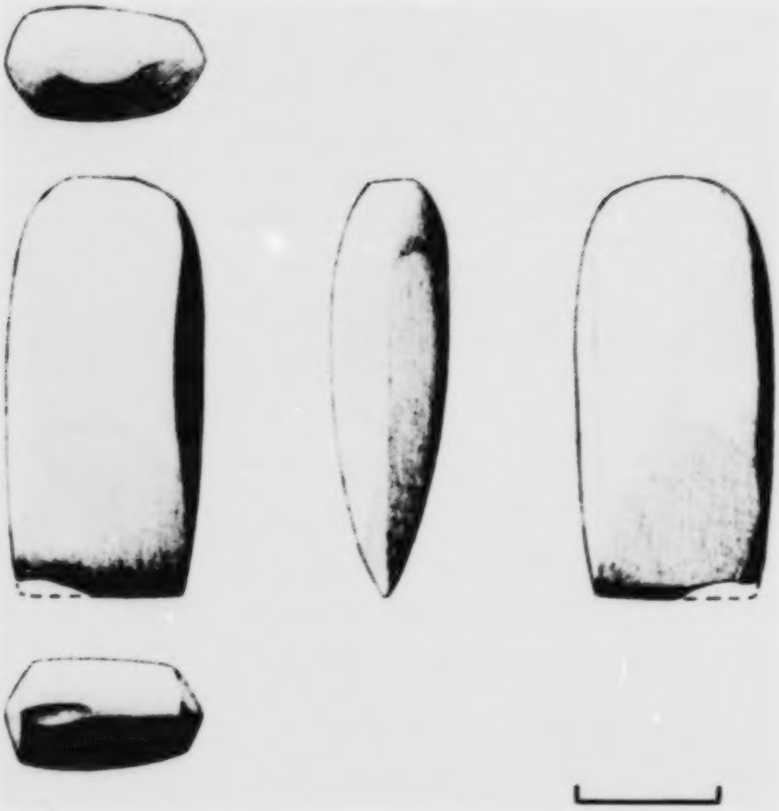


Figure 43. Round-polled narrow celt from Zone Ib (1T1H22A-2768).

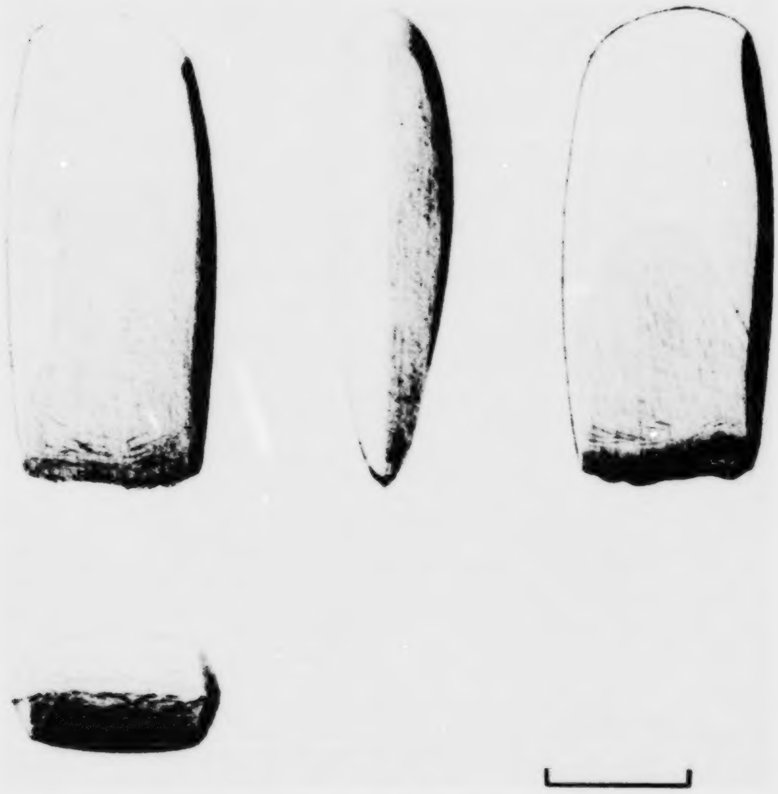


Figure 44. Round-polled narrow celt from Zone Ib (1T2H22-2482).

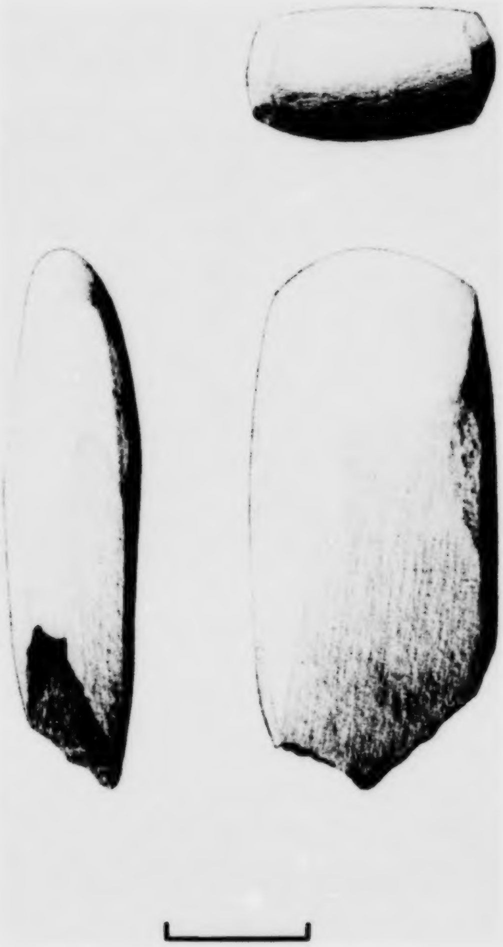


Figure 45. Round-polled narrow celt from Zone IIa (1T1C27-1579x).

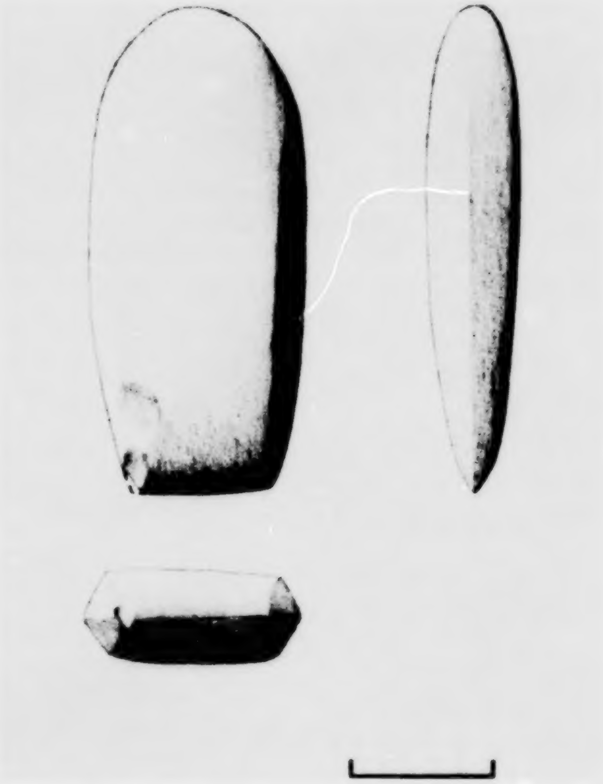


Figure 46. Round-polled narrow celt from Zone IIa (1T2C23-1171).

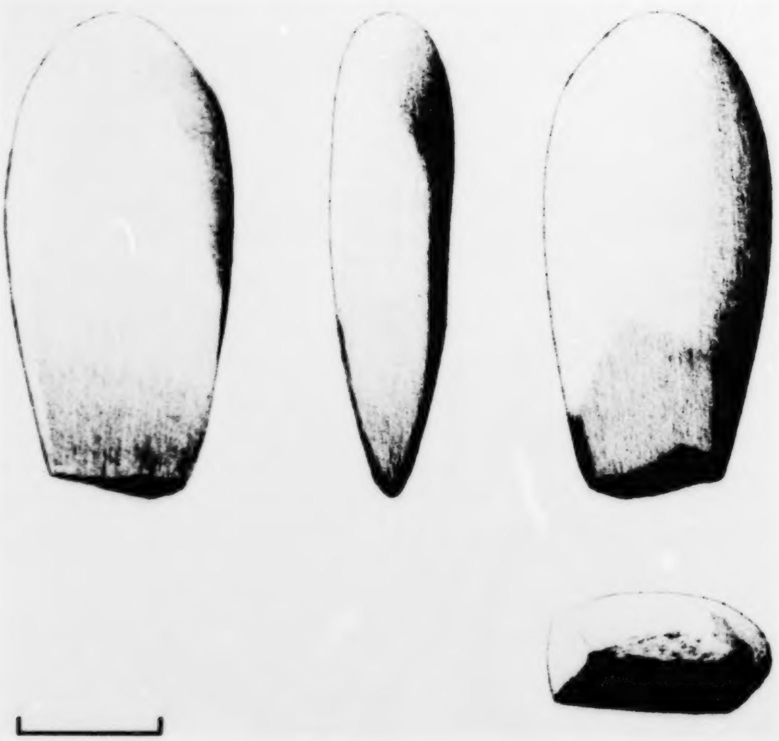


Figure 47. Round-polled narrow celt (1T1X1-3318).

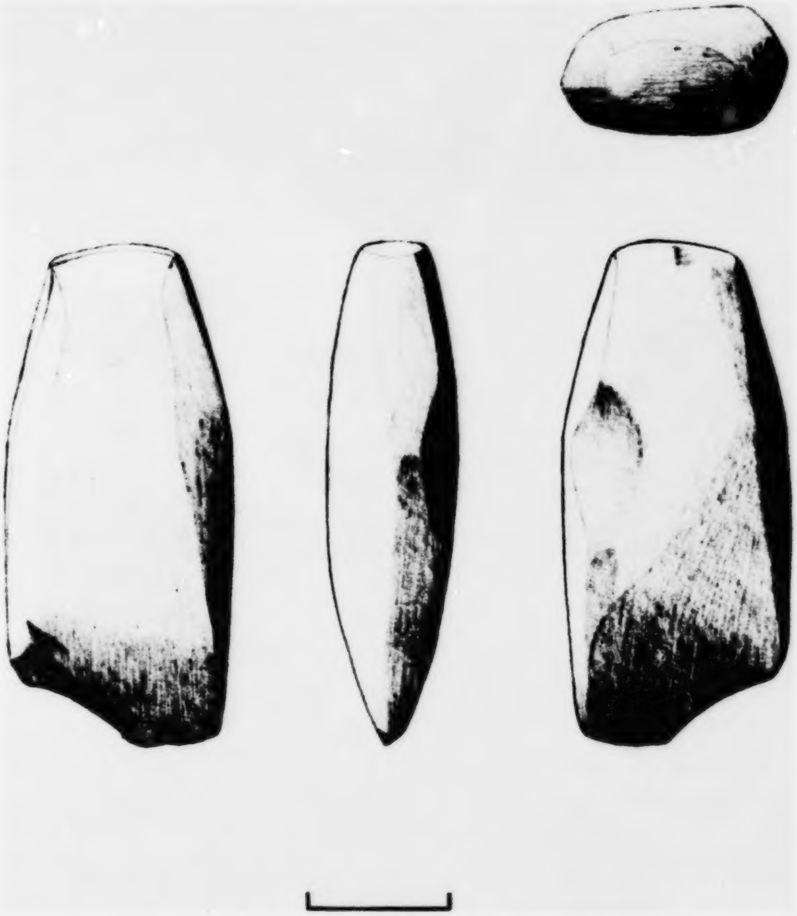


Figure 48. Flat-polled narrow celt from Zone Ib (1T2A26-1309).

Flat-polled narrow celts. The flat-polled narrow celts (Figs. 48-56; Table 21) were found in the uppermost level of Zone Ib and in Zones IIa, IIId and IV. These celts tend to have more and better-defined bevelled surfaces than the round-polled celts. The widest and thickest portions are more emphasized by the bevels, so that they form a shoulder in the upper third of the celt. The sides and faces above the shoulder taper to an almost flat poll. The sides above the shoulder usually have three bevels each. The adjacent faces are ground nearly flat across. The edge where the faces and poll meet is often bevelled. The polls are usually slightly excurvate in outline, but almost flat in profile. Below each shoulder the sides and faces turn inwards. The lower sides often have three bevels, but two, four and even five side bevels are sometimes present. Two celts have depressions in the side and adjacent face at the shoulder (Figs. 48, 51), possibly to aid hafting. Only three specimens have partly intact blades. Two

(Figs. 48, 53) are shaped and worn like the blades described for the round-polled celts. The only intact blade (Fig. 55) is 27 mm long. More wear, indicated by loss of blade surface and vertical striae, is found from 3 to 5 mm from the blade edge with the shallow angled bevel. The other face, having a steeper bevel, is less worn and bears many horizontal sharpening striae. Again, the closeness of this wear pattern to the blade edge suggests less movement of the tool and may indicate use as chisels.

Table 21. Flat Polled Celts: Proveniences, Dimensions (mm) and Materials

Zone/Stratum	Artifact No.	Length	Shoulder Width	Shoulder Thickness	Blade Length	Poll Width	Poll Thickness	Material*	Fig. No.
IVa	1T2C5-551x	71	29	19	27	25	9	BTM	55
IVa	1T1E4A-1307	78	35	20	36	18	11	BGF	53
IVa	1T1E4A-1312	72	34	21	-**	25	12	BGF	54
IVb	1T1H5-1345	frag.						BA	
IIId	1T3A8-254x	85+	34	18	-**	21	6	BF	52
IIa	1T1E23-2375	inc.	38	24	-**	28	15	BGF	49
IIa	1T1H20B-3422x	74+	33	18	-**	18	9	BGF	50
IIa	1T1J13-2423x	63+	29	19	-**	21	13	BTM	51
Ib	1T2A26-1309	75	33	19	-**	19	10	BPM	48
no provenience	1T1X1-1199x	75	34	17	-**	27	12	BTA	56

* Identified by Muller (1979).
** Incomplete.

Dimensions of the flat-polled narrow celts (Table 21) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	71-78	74.2	2.77	5
shoulder width	29-38	33.2	2.81	9
shoulder thickness	17-24	19.4	2.07	9
blade length	27-36	31.5	6.36	2
poll width	18-28	22.4	3.88	9
poll thickness	6-15	10.79	2.64	9

The above summary compares well with that for the round-polled celts.

One specimen included above is of interest for its size and provenience at the base of Zone IIa. This artifact is a heavily patinated upper portion of a flat-polled celt (Fig. 49) with proportions about one and one-half times those of the other flat-polled celts. This specimen is perhaps an example of an early or larger variety.

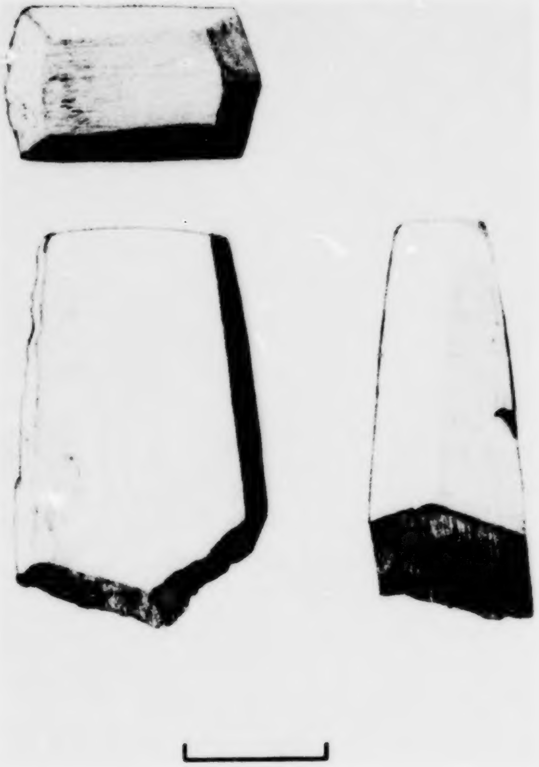


Figure 49. Fragment of flat-polled narrow celt from Zone IIa (1T1E23-2375).

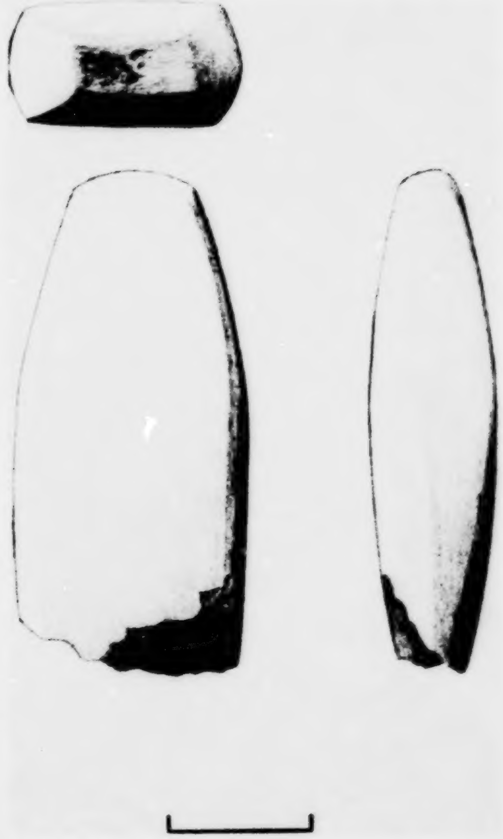


Figure 50. Flat-polled narrow celt from Zone IIa (1T1H20B-3422x).

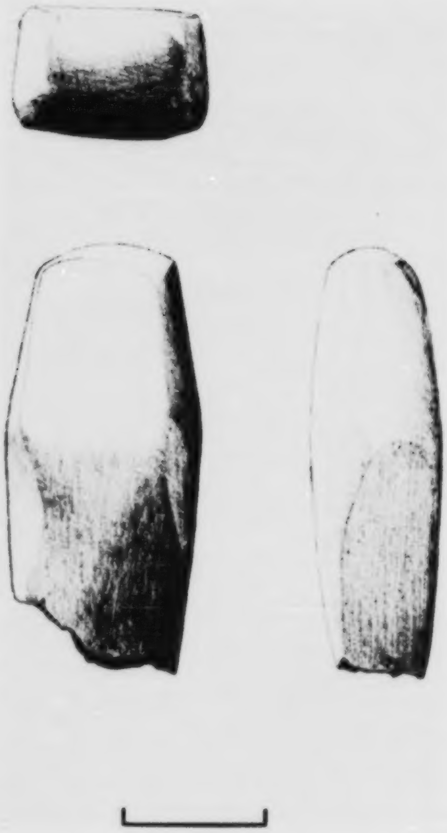


Figure 51. Flat-polled narrow celt from Zone IIa (1T1J13-2423x).

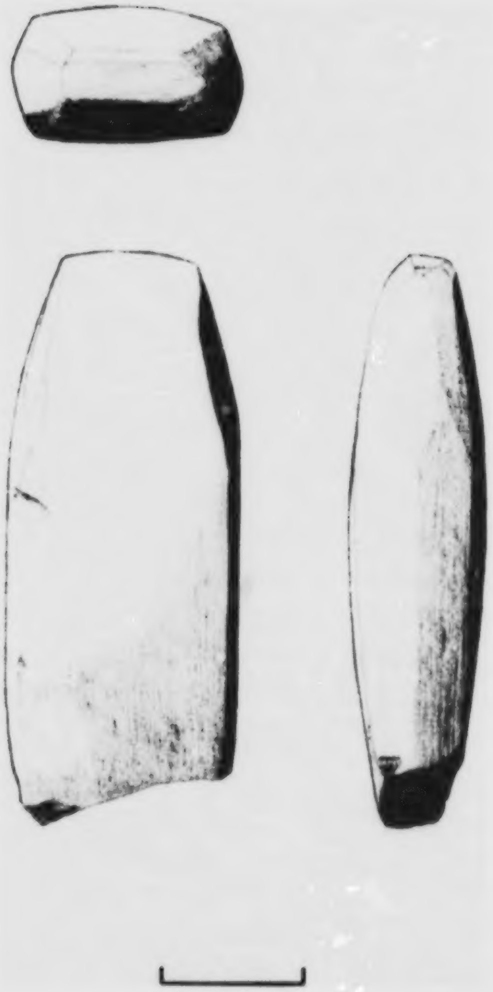


Figure 52. Flat-polled narrow celt from Zone IIId (1T3A8-254x).

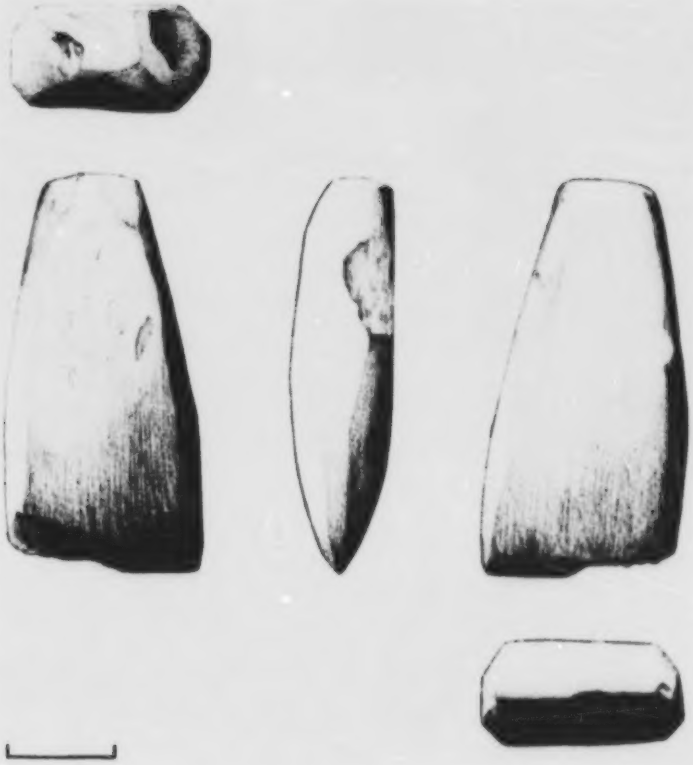


Figure 53. Flat-polled narrow celt from Zone IVa (1T1E4A-1307).

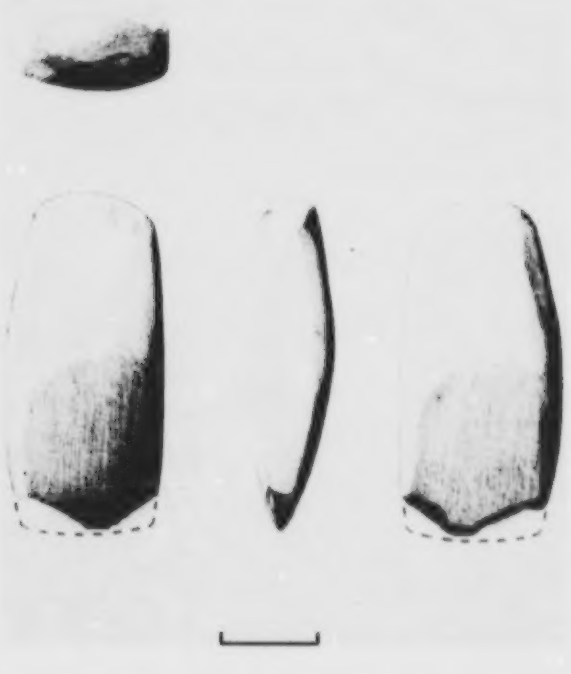


Figure 54. Flat-polled narrow celt from Zone IVa (1T1E4A-1312).

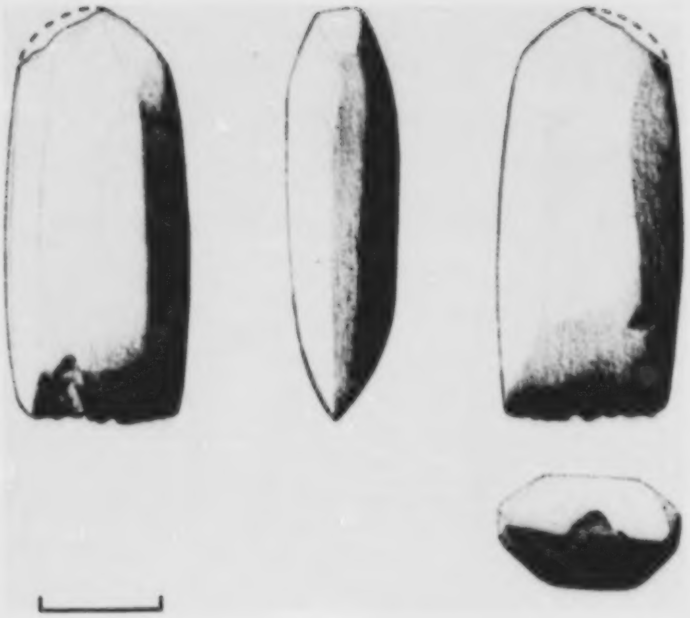


Figure 55. Flat-polled narrow celt from Zone IVa (1T2C5-551x).

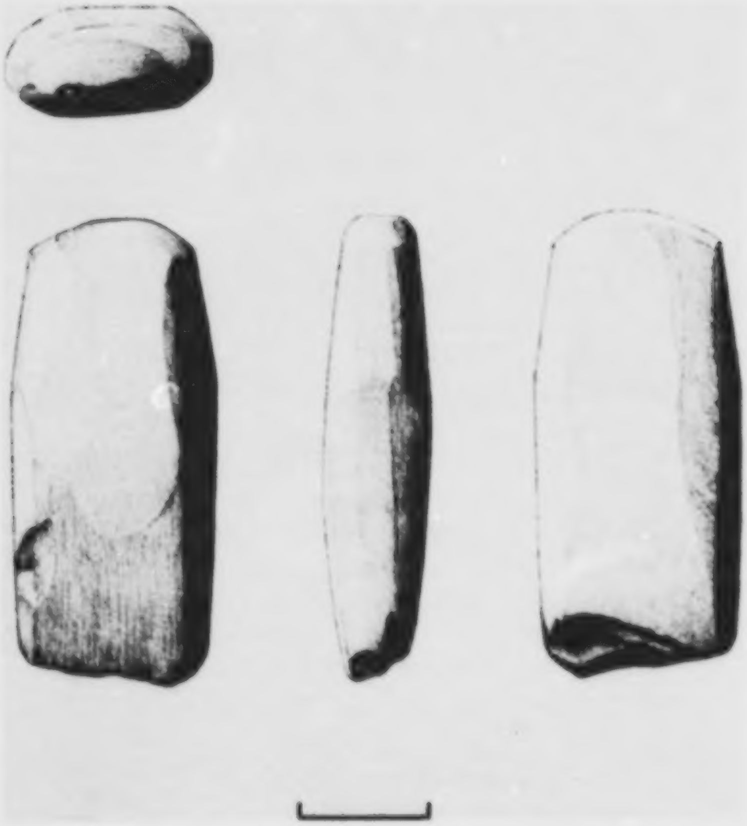


Figure 56. Flat-polled narrow celt (1T1X1-1199).

Other stone celts. Seven celts broken, uncompleted or otherwise different from the above specimens will be discussed one by one. Most of these artifacts are probably flat-polled celts that do not fit well into the above grouping because of significant differences.

One celt of medium-grained basaltic tuff (Muller 1979) lacks a poll from either fracturing or uncompletion (Fig. 58). Each side has three bevels. In outline the sides expand only slightly from the blade edge. In profile the faces gradually converge to form a symmetrical cutting edge. The blade, slightly curved in outline and straight in end view, has no sharpening bevels. In fact, no striae were observed on the blade. The blade is 31 mm long. The celt is 58 mm long, 34 mm wide and 24 mm thick. It was recovered from near the base of Zone IIb.

Another celt without a poll (Fig. 62), from Zone IVa, is made of aphanitic to fine-grained basaltic tuff (Muller 1979). Two bevels form a centre ridge down each side. The sides and faces are markedly convex, reaching maximum dimensions of 30 mm wide and 16 mm thick just above the middle. The blade, 21 mm long, is straight in both end view and outline. Its profile is symmetrical with two well-defined bevels 6 mm wide and 5 mm wide. The latter is worn close to the cutting edge and has more surface removed from use than the opposing bevel. It has few traces of wear and many horizontal sharpening striae. This pattern, like that on the narrow celts, suggests use as a chisel. The artifact is 65 mm long.

A complete celt (Fig. 59) from the base of Zone IIa is made of fine-grained porphyritic basalt (Muller 1979). It is like the flat polled narrow celts, but lacks a well-defined shoulder. The slightly convex poll, 34 mm wide by 19 mm thick, is the largest part of the celt. The poll is surrounded by a narrow bevel. Each side consists of two bevels that meet in a central longitudinal ridge. The faces are ground flat across. One face has a shallow depression ground from one side and near to the poll, possibly to assist hafting. The blade, 24 mm long, is straight in outline and end view. Two bevels, 9 mm and 7 mm wide, form a nearly symmetrical cutting edge. The wider bevel has heavy longitudinal striae. The narrower bevel has lost more surface area. The celt is 60 mm long.

A small celt of medium-grained basaltic tuff (Muller 1979), from Zone IIIb, has affinities with the flat-polled celts. When intact, the poll was probably slightly convex like those on the flat-polled celts. Much of the poll and part of one face have broken away (Fig. 60), possibly from pounding on the poll. Both sides on the upper two-thirds of the artifact were originally ground into a single convex surface; the lower third was left very convex. The side and faces are convex in outline. The blade, 27 mm long, is straight in outline and in end view. Two bevels 15 mm wide form the blade, slightly asymmetrical in profile. One bevel is slightly steeper than the other. One face has lost more surface through use, than the opposite face which has horizontal sharpening striae. Both faces are worn closely to the blade edge, suggesting use as a chisel. The celt is 53 mm long, 34 mm wide and 18 mm thick.

An unusually shaped celt of fine-grained basalt (Muller 1979) was recovered from Zone IIIc. The poll, 25 mm wide by 9 mm thick, is ground flat (Fig. 61). One adjacent face and both adjacent sides are bevelled.

Both sides are slightly convex in outline and unbevelled. One face is ground flat across and retains some unfinished pecked surfaces. The other face is convex across. In profile the faces are convex and symmetrical at the blade. No well-defined blade bevels are present. The cutting edge, when intact, was an estimated 27 mm long, slightly curved in outline and straight in end view. Wear and loss of surface through use is very close (3 mm) to the cutting edge and abundant on the flat face of the blade, as opposed to little wear and horizontal sharpening striae on the opposite curved blade face. The worn flat face also has sharpening striae and a fine sharpening (?) bevel 2 mm wide along the cutting edge. The celt is 73 mm long, 36 mm wide and 18 mm thick.

The longest and most simply shaped celt, of aquagene tuff (Muller 1979), was recovered from the upper levels of Zone Ib. The celt has no body bevels and an unshaped poll (Fig. 57). The poll, 32 mm wide by 18 mm thick, appears unfinished. Chipped surfaces adjacent to the poll suggest that it had been pounded. The sides are rounded transversely instead of angularly bevelled. Sides and faces are straight and almost parallel in both outline and profile. The blade consists of two semi-circular bevels asymmetrical in profile. The blade, 34 mm long, is straight in both outline and end view. It is covered by a rust-coloured patina which obscures striae. The celt is 102 mm long.

A fragment of ground aphanitic basalt (Donaldson 1970), 1T1H5-1345, appears to be a side portion of a narrow flat-polled celt. It was recovered from Zone IVb.

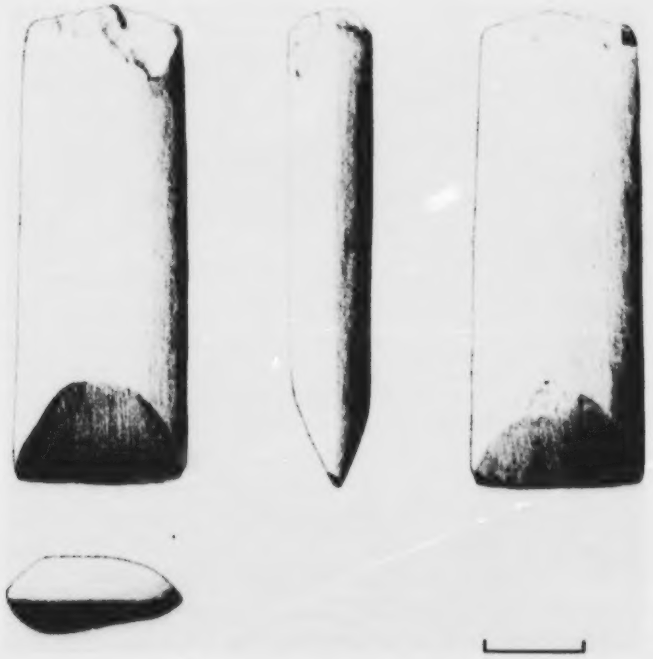


Figure 57. Celt of aquagene tuff from upper levels of Zone Ib (1T1E25-2456).

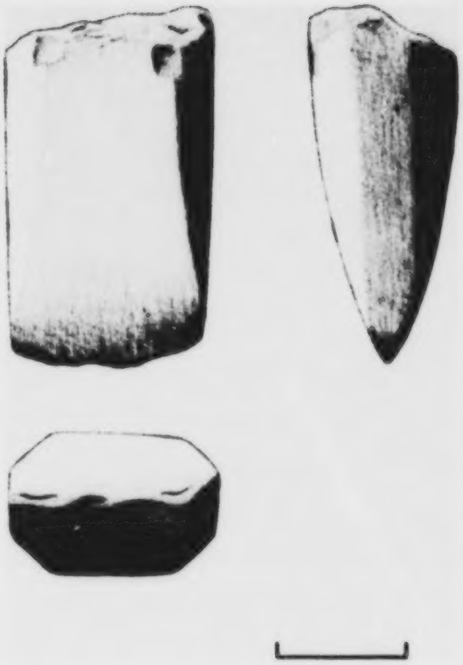


Figure 58. Celt of basaltic tuff from the base of Zone IIa (1T1J21B-2617).

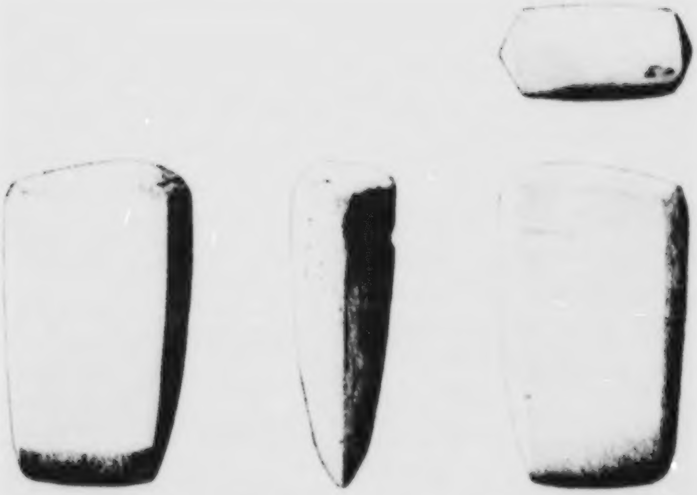


Figure 59. Celt of porphyritic basalt from the base of Zone IIa (1T1H20A-2700).

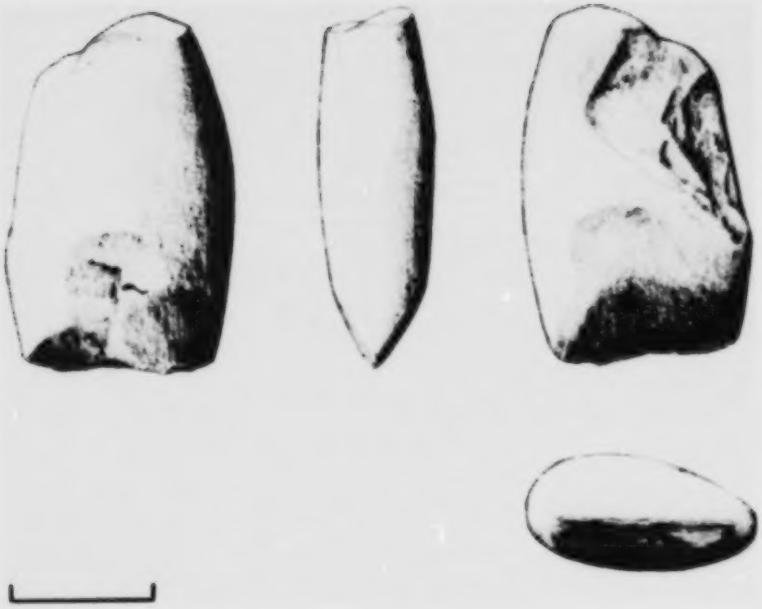


Figure 60. Celt of basaltic tuff from Zone IIIb (1T2J7-1531).

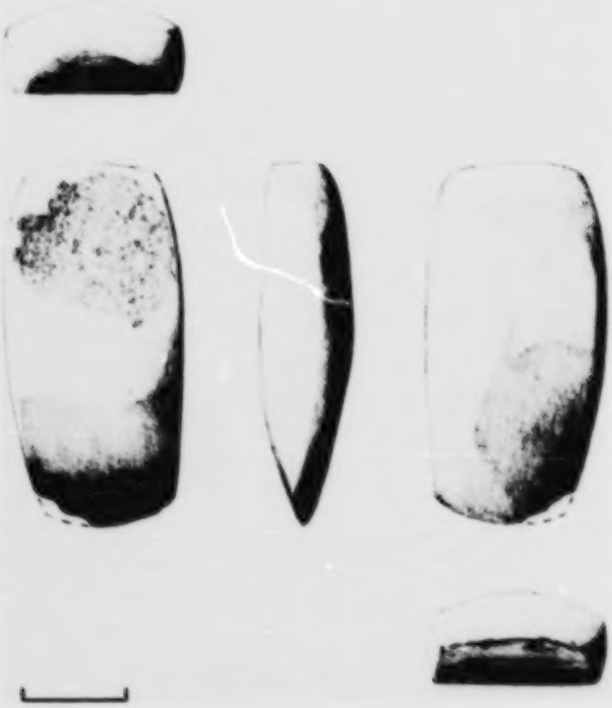


Figure 61. Celt of fine-grained basalt from Zone IIIc (1T2D12-2363x).

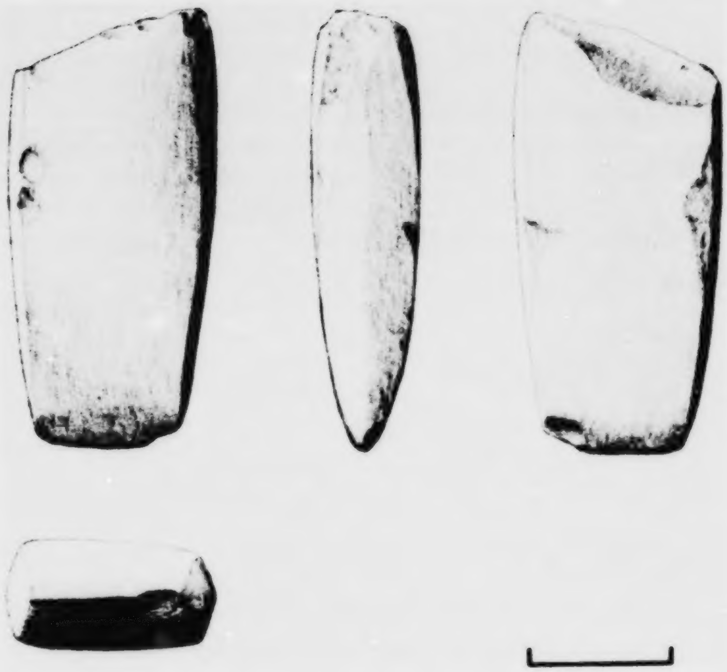


Figure 62. Celt of basaltic tuff from Zone IVa (1T1E5-1328).

Broad celts. In contrast to the many narrow celts recovered, four celts are distinctly broad, flat and wide bladed. Their shape, proportions, wear patterns and similarity to tools reported ethnographically suggest use as adze heads. The broad celts were found in Zones Ib, IIa and IVa.

All four celts are relatively uniform in shape (Figs. 63-66). The polls, mostly intact on three specimens, are slightly excurvate. One poll appears unfinished (Fig. 63); another is pitted from either shaping or being hammered (Fig. 64). Sides of the celts are straight, or in one

Table 22. Broad Celts: Proveniences, Dimensions (mm) and Materials

Zone/Stratum	Artifact No.	Length	Blade Length	Blade Thickness	Poll Width	Poll Thickness	Material*	Fig. No.
IVa	1T2B2A-113x	57+	33+	14	-**	-**	BTM	66
IIa	1T2E16-2024x	48	42	11	30	11	BAmF	65
IIa	1T2G12-1545x	36	33	9	30	10	FAr	64
Ib	1T1G28-2679	57	43	15	35	12	AqT	63
Clayoquot adzes (Koppert 1930: 36)		64	45	16	-**	13	-**	

* Identified by Muller (1979).

** Incomplete.

case, slightly tapering toward the poll. The sides are ground flat across and bevelled slightly at the corners; one specimen is heavily bevelled at the corners. The faces are flat or slightly convex across. The blades are bifacially bevelled. In side view the blade is nearly symmetrical. In outline and in end view the blade is straight or slightly excurvate. The blade in proportion to the complete celt is almost as long as the celt. The blade bevels are wide, about one-fifth as long as the celt.

Dimensions (Table 22) are remarkably similar:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	36-57	47	10.5	3
blade length	33-43	39.33	5.5	3
blade thickness	9-15	12.25	2.75	4
poll width	30-35	31.66	2.88	3
poll thickness	10-12	12.25	2.75	3

Dimensions of the broad celts correspond closely to the general dimensions of stone bits for D-adzes at Clayoquot Sound, reported by Koppert (1930: 36). His measurements, converted to millimetres, are included for comparison with the broad celt dimensions (Table 22).

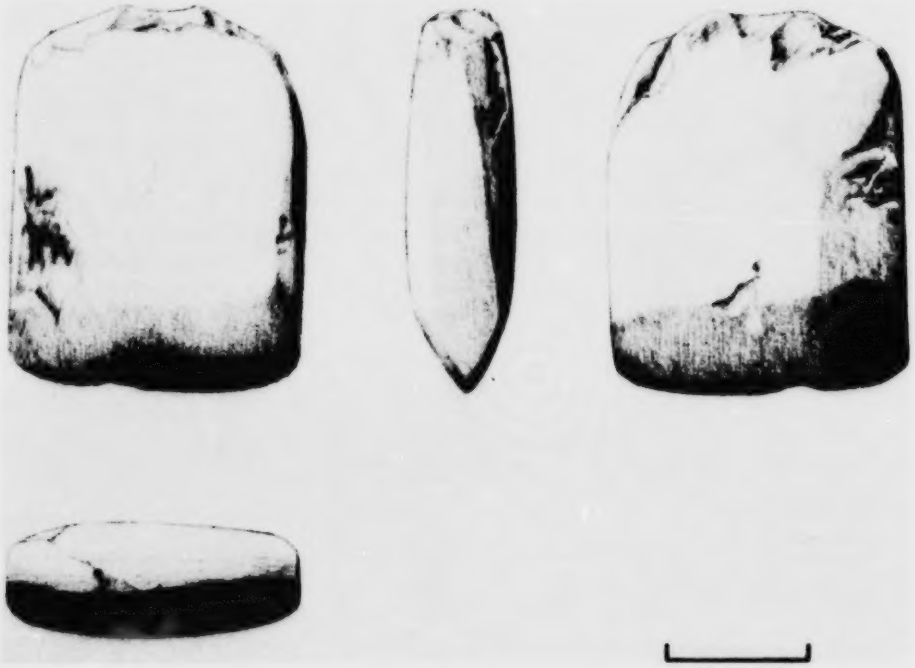


Figure 63. Broad celt of aquagene tuff from Zone Ib (1T1G28-2679).

Blade wear on the broad celts also suggests that they served as adze heads. On three specimens, the front face which curves inward at a sharper angle than the rear face is more worn and bears more striae. In contrast, the rear face is less worn and bears sharpening scratches. On one specimen (Fig. 66) the opened vesicles on the front face are elongated from wear, and the surface surrounding the vesicles shows some vertical striae; the rear face shows less wear and many sharpening striae. On another specimen (Fig. 65) the front face displays more heavy vertical striae and wear than the rear face which has few vertical striae, little wear and many horizontal sharpening striae. These wear patterns suggest use as adzes according to Semenov's criteria (1964: 126-131).

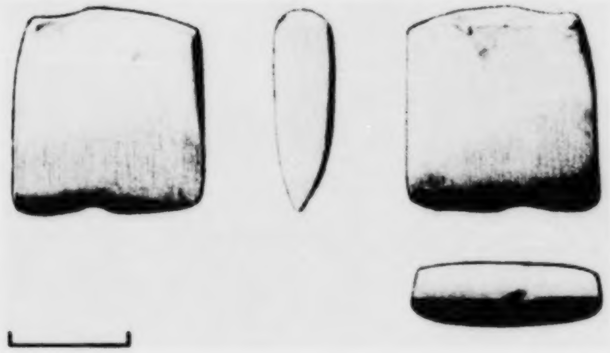


Figure 64. Broad celt of feldspathic argillite from Zone IIa (1T2G12-1545x).

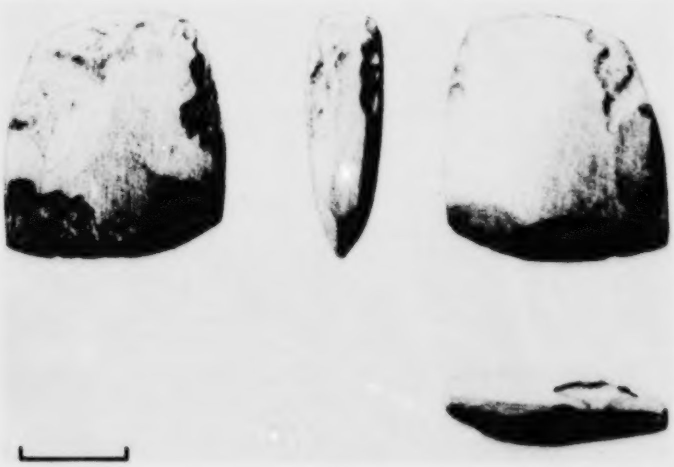


Figure 65. Broad celt of fine-grained amygdaloidal basalt from Zone IIa (1T2E16-2024x).

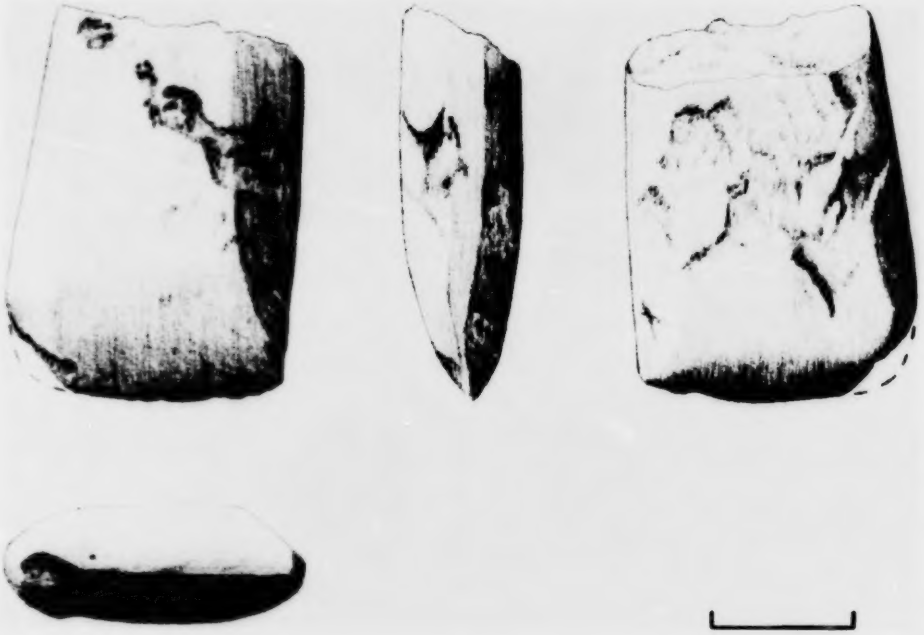


Figure 66. Fragmentary broad celt of basaltic tuff from Zone IVa (1T2B2A-113x).

Uncompleted stone celts. Four artifacts illustrate stages of the chipping, pecking and grinding technology used for working stone, as described earlier. Three specimens are worked elliptical cobbles which may be celts in the earliest stages of manufacture. The fourth artifact is an uncompleted round polled narrow celt in advanced stages of manufacture.

A cobble of aphanitic to fine-grained basaltic tuff (Muller 1979) from the lower levels of Zone IIa has been heavily chipped on both sides and one face (Fig. 67c). Presumably, this rough chipping is the first stage in shaping a celt from a beach stone. It is 84 mm long, 48 mm wide and 24 mm thick.

A long, thin pebble of fine-grained basalt (Muller 1979) from the base of Zone IVa is chipped on two faces at one end; the rounded end has been removed (Fig. 67b). The chipped surfaces are slightly worn, and the intact end shows slight pitting from pounding. Possibly this artifact was used as a wedge. It is 62 mm long, 26 mm wide and 12 mm thick.

A thin pebble of fine-grained basalt (Donaldson 1970) from the base of Zone IIa has been chipped on one side and then ground flat (Fig. 67d). It suggests the side of a celt. The artifact is 82 mm long, 39 mm wide and 15 mm thick.

An uncompleted round-polled narrow celt of basalt-prophyry (Muller 1979) was recovered from the base of Zone IIa. The faces, sides and poll are ground flat and are more or less completed (Fig. 67a). The

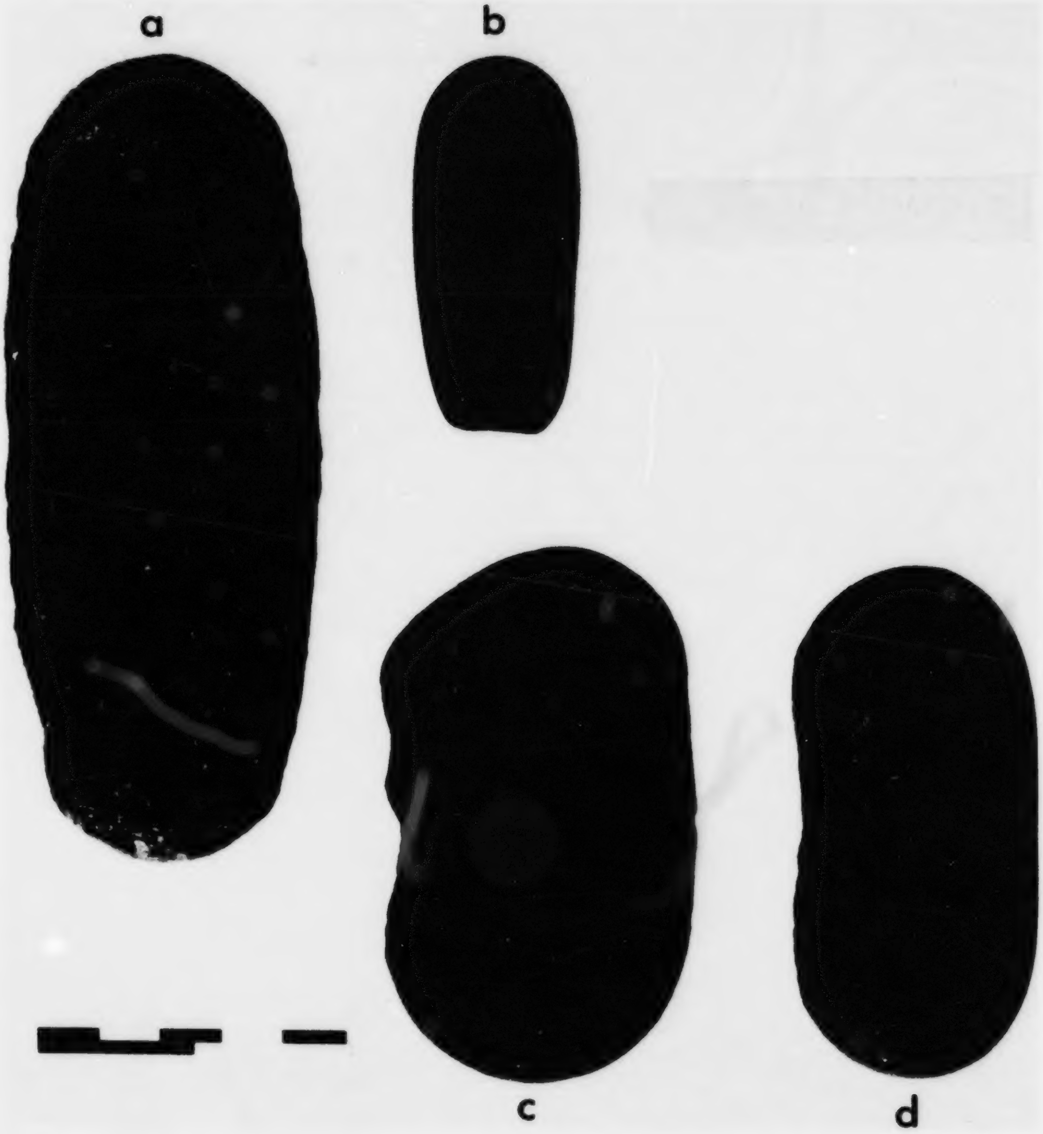


Figure 67. Uncompleted stone celts: a, 1T1E21-2291x; b, 1T2B6-204x; c, 1T1H19B-2642; d, 1T2F24-3666x. (Scale: cm, in.)

edge bevels between the sides, and faces have been pecked out and remain to be ground flat. Heavy pecking has been started on one face to detach a rounded end so that the blade can be shaped. The artifact is 124 mm long, 43 mm wide and 35 mm thick.

Shell celts. A celt and a blade fragment, both of California mussel, were the only cutting tools of shell recovered. Ethnographical sources (Moziño 1970: 44; Drucker 1951: 63, 78), however, suggest that shell tools were likely more common than this extremely limited archaeological sample would indicate. Mussel shell was abundant in the midden, but unlike the shells of other molluscs, the mussel valves did not remain intact for very long. Large fragments of mussel shell often had the strength and consistency of soggy newspaper. The shell layers tended to separate longitudinally and then break apart. This process of decomposition probably claimed most mussel shell artifacts.

A nearly complete celt (Fig. 68) from Zone IVb resembles the stone celts. The poll is slightly rounded; the slightly excurvate sides expand and terminate in an asymmetrically curved blade. The celt in cross section is cancavo-convex, with lateral edges ground flat. The rear face is the naturally concave interior surface of the mussel valve. The front face is the naturally convex, rough exterior surface of the valve. Some of this surface along the blade has been ground obliquely to form the front face of the cutting edge. Most of the outer layer of shell along the cutting edge has broken away. The rear face of the cutting edge is a single bevel ground at roughly a 45° angle to the faces. In both outline and end view the cutting edge is curved. It is 29.5 mm wide and 5.5 mm thick. The poll is 20 mm wide and 7 mm thick. The celt measures 54 mm long, 30 mm wide and 8 mm thick.

The fragment (Fig. 69) from the middle levels of Zone III is charred and thereby preserved well. It consists of part of the blade and one lateral edge. Cross section is concavo-convex, owing to the

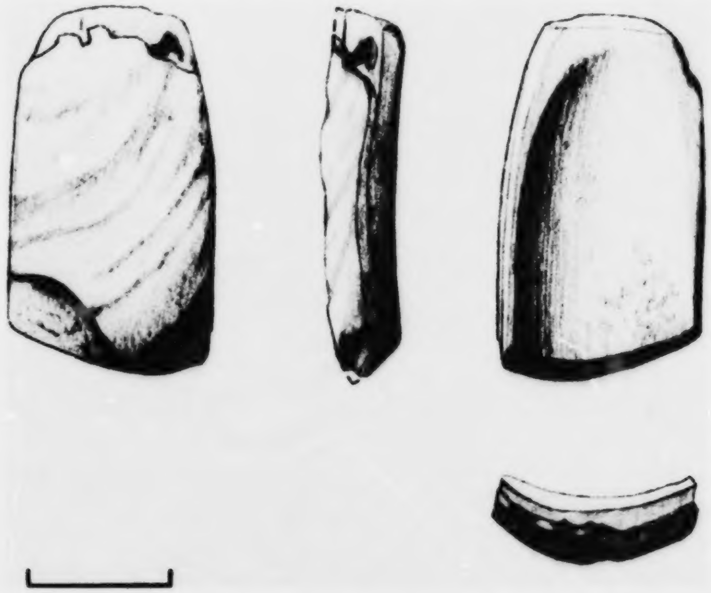


Figure 68. Celt of Mytilus californianus from Zone IVb (1T1H5-1336). (Scale for Figs. 68-72: 0-2 cm.)

natural shape of the valve faces. Most of the rough, wavy exterior valve surface of the front face is ground nearly flat, especially within 7 mm of the cutting edge. The rear face of the cutting edge is a single bevel, 3.5 mm wide, ground at a 45° angle to the front face. Above the bevel, the naturally concave valve interior surface remains unmodified. In both end view and outline the cutting edge is curved. The blade is 4 mm thick. The flat lateral edge is 4 mm thick. The artifact is too incomplete to enable functional identification.

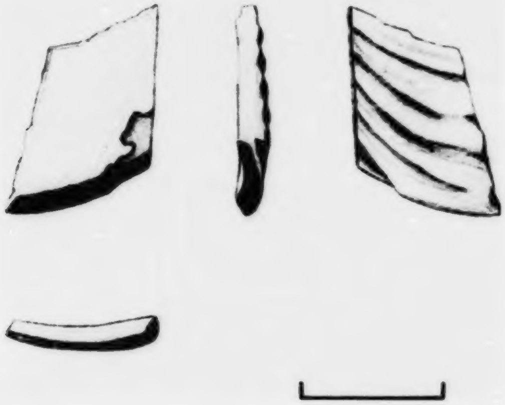


Figure 69. Fragment of M. californianus celt from Zone III (1T1J13-2424).

Bone adzes and gouges. Four artifacts of dense land mammal bone (Figs. 70-72) may be broken heads of adzes or gouges. The upper portion and one side is missing on three artifacts. Enough of one side and the cutting edge remain to indicate the shape.

The artifacts, when intact, were presumably bilaterally symmetrical. Cross section is concavo-convex. The convex face is the cortex of the bone, whereas the concave face includes the marrow channel and sides exposed by splitting or sawing. On two specimens from Zone IVb, the sides formed by splitting are ground flat (Figs. 71, 72). The concave or rear working face on all four artifacts is bevelled at a sharp angle to the cutting edge. The convex or front working face curves gradually to meet the rear face in a sharp cutting edge curved both in outline and end view. The front faces and bevels on the rear faces are very worn and shiny.

The artifact most intact (Fig. 70), from Zone IIa, originally had a cutting edge wider than 30 mm and was longer than 73 mm. The other two artifacts are too incomplete to suggest original dimensions. The fourth artifact, 1T1K9-5382x, from the uppermost level of Zone IIa, is only a corner fragment of the cutting edge and one side.

Although two artifacts are from historic period deposits, no tools like them have been described or collected ethnographically from the Nootka culture area. The wear patterns, however, provide some clues regarding use. The front face of the most intact artifact (Fig. 70) is chipped near one side from use. Tiny parallel grooves indent the front of the cutting edge at the same axis as the sides. This indicates that most wear occurred on the front convex face. Such a wear pattern and blade shape are like those described for adzes (Semenov 1964: 129).

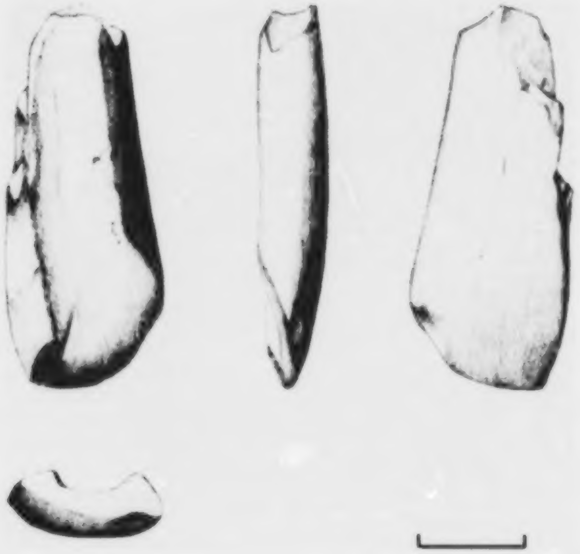


Figure 70. Fragmentary celt of land mammal bone from Zone IIa (1T2C20-1120).

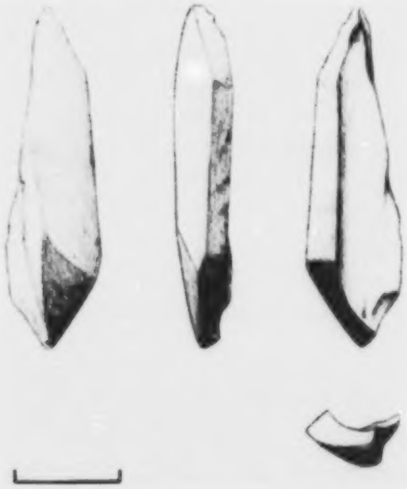


Figure 71. Fragment of land mammal bone celt from Zone IVb (1T1J3B-1670).

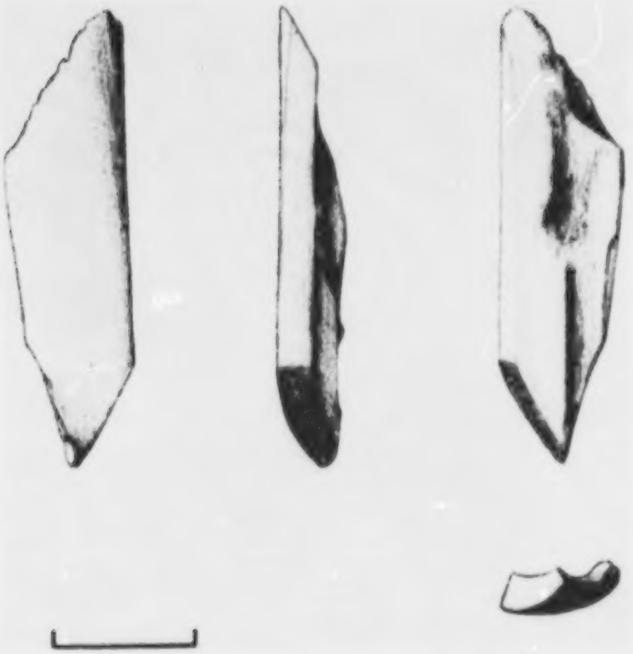


Figure 72. Fragment of land mammal bone celt from Zone IVb (1T1H7B-1485).

Wedges

Fifteen artifacts are inferred by means of shape and wear patterns to have been wedges. They include two classes based on material and shape. Probable stone wedges consist of several pebbles flaked in a distinctive bipolar pattern. These appear confined to Zones I and II. Mammal bone wedges suggesting shape and size varieties were found in most zones, and appear to have remained basically the same through time.

Flaked stone wedges. Six stone artifacts from Zones Ib and IIa are believed to have been used as wedges. They include five flaked elliptical beach stones (Table 23) and one worked flake.

Table 23. Flaked Stone Wedges: Proveniences, Dimensions (mm) and Materials

Zone/Stratum	Artifact No.	Length	Width	Thickness	Bit Edge Length	Bit Edge Thickness	Material*	Fig. No.
IIa	1T2C19-804x	42 46+	46+ 42	16 16	27 -**	2 -**	BA	75
IIa	1T1E23-2978x	57	38	10	23	2	BGF	73
IIa	1T1J22B-3674x	36	30	11	13	2	BF	73b
Ib	1T1E24A-2980x	46	41	13	22	2	DTN	74
Ib	1T2B30-3639x	40	25	10	16	1	BGF	73c

* Identified by Muller (1979) and Donaldson (1970).
** Incomplete.

The worked flake of medium-grained basalt (Donaldson 1970), from Zone Ib, was detached from a smooth beach stone. All edges, except for the striking platform, have several tiny flakes detached from one face or both faces (Fig. 73a). The edge and faces of the flake are extremely worn, possibly from strong pressure on the surfaces as in wedging. The surfaces of the flake also appear water worn. The flake is 27.5 by 32.5 mm across, 1 mm thick at the edge and 5 mm thick at the bulb of percussion.

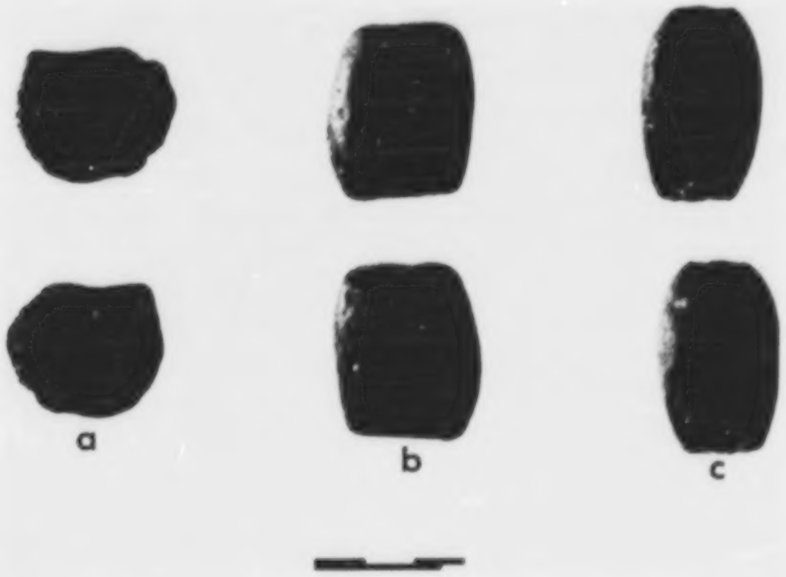


Figure 73. Flaked stone wedges: a, waterworn worked basalt flake from Zone Ib (1T1E29B-3677x); b, waterworn flaked basalt pebble from base of Zone IIa (1T1J22B-3674x); c, flaked basalt pebble from Zone Ib (1T2B30-3639x). (Scale: cm, in.)

The five worked elliptical beach stones (Figs. 73b,c,-76; Table 23) have a distinctive flaking pattern exemplified by a little worn or used specimen (Fig. 73c) from Zone Ib. The artifact was originally a thin, elliptical beach pebble. One end was struck several times to render it straight in both end view and outline; both faces at this end are chipped and rough from blows. The opposite end was also removed, and several flakes on both faces were subsequently detached, leaving a sharp edge straight in outline, but slightly curved in end view. The edge is 14 mm wide and 1 mm thick. It is difficult to determine whether or not the artifact was made by direct percussion or by bipolar flaking. Simple direct percussion could perhaps produce the flaking pattern in soft stone, but dense stone may have required bipolar flaking (R. Bonnichsen, personal communication). Most of the worked stones are varieties of basalt (Table 23). Controlled experiments are likely required to determine with reasonable certainty the manufacturing technique used.

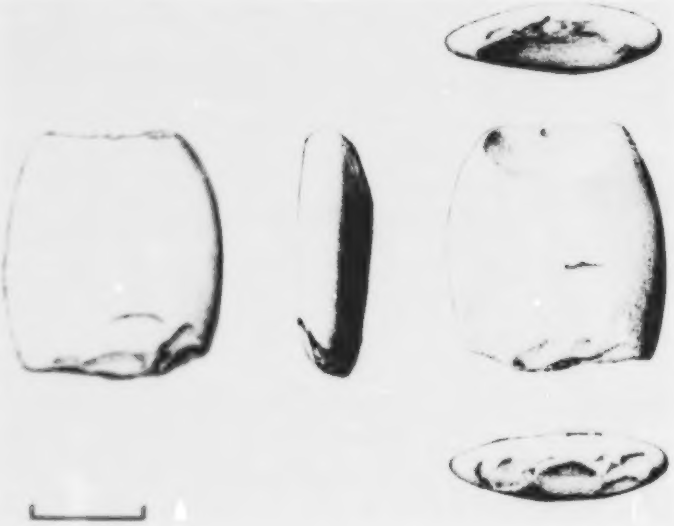


Figure 74. Flaked pebble wedge of dacite tuff from Zone Ib (1T1E24A-2980x). (Scale for Figs. 74-76: 0-2 cm.)

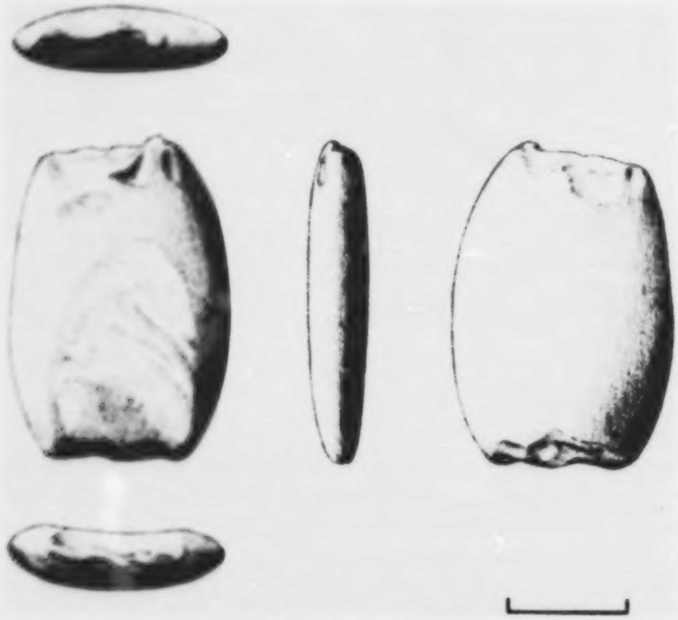


Figure 75. Flaked pebble wedge of basalt from base of Zone IIa (1T1E23-2978x).

The other worked pebbles, with a similar flaking pattern, are very battered and worn. Three are heavily battered on the proximal end, and extremely worn on the distal end (Figs. 74-76); one of these artifacts with a broken side has also had flakes removed there (Fig. 76). Even the flake scars on all the artifacts are heavily worn. The heavy proximal battering and wear on the distal edge and both faces suggest use as a wedge, with wear on the faces resulting from pressure of the surfaces being split. These artifacts also appear to have been further worn by water. Flaking and wear on the fifth worked pebble (Fig. 73b) seem to have been extensively water worn. Many mammal remains from the Zone I deposits were also water worn (H. Savage, personal communication). Such water wear, as suggested in the discussion of stratification may have occurred from occasional flooding by stormy winter seas, when the site was lower and the sea level perhaps higher.

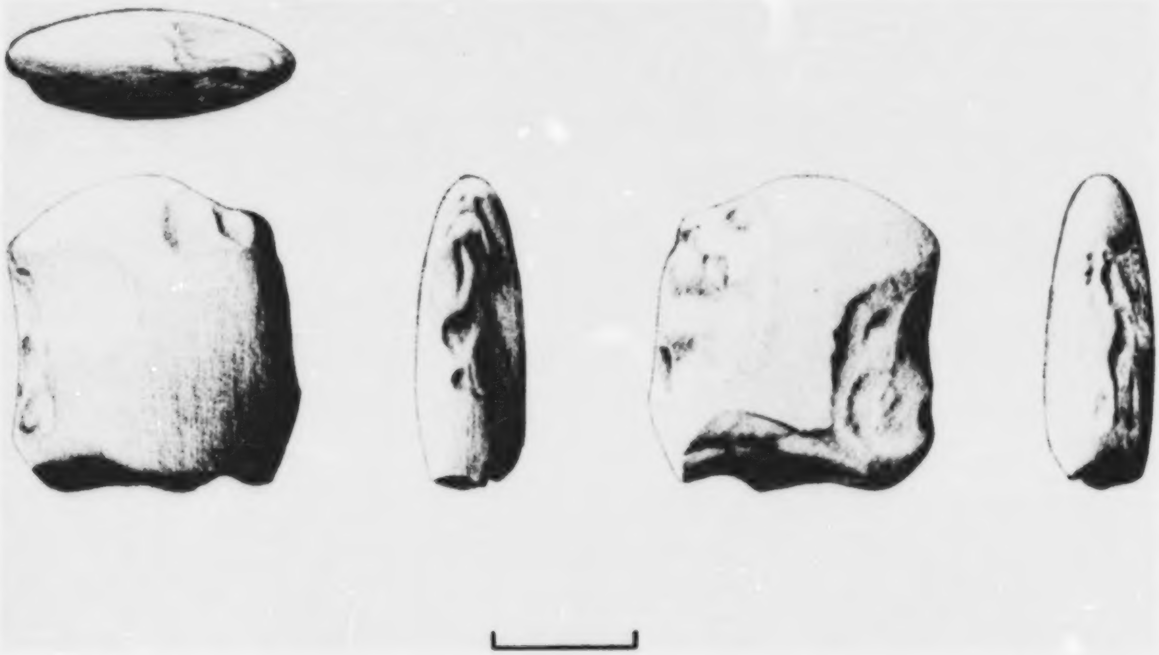


Figure 76. Flaked pebble wedge of basalt from Zone IIa (1T2C19-804x).

Bone wedges. Nine artifacts of sea mammal bone and land mammal bone from Zones II, III and IV have been identified as wedges through inference from wear patterns and shape attributes. The tips or bits are compacted from pressure and shiny from wear. The faces also display these wear attributes, but to a lesser degree, usually only on projecting surfaces. The polls often show some compactness or fracturing resulting from hammering. Although the artifacts vary considerably in shape, all have a wedge-shaped end. The wide range in shape of the nine artifacts indicates that little worked to extensively shaped bone could be used for wedges. The nine artifacts suggest three shapes that may have functional significance: tiny wedges, presumably for extremely fine work; long, narrow, thick wedges; and broad, flat, thin wedges.

Tiny wedge. The smallest and most complete wedge (Fig. 77a), from the base of Zone IIa, is made from split dense land mammal bone. The bit is asymmetrically shaped in side view. One face is ground flat at a sharp angle, and the opposing face with the marrow channel is ground at a shallow angle to form a straight edged, wedge-shaped tip 5 mm wide. The sides near the tip are ground slightly inward to prevent splitting and breakage from pressure applied to the sides and faces.

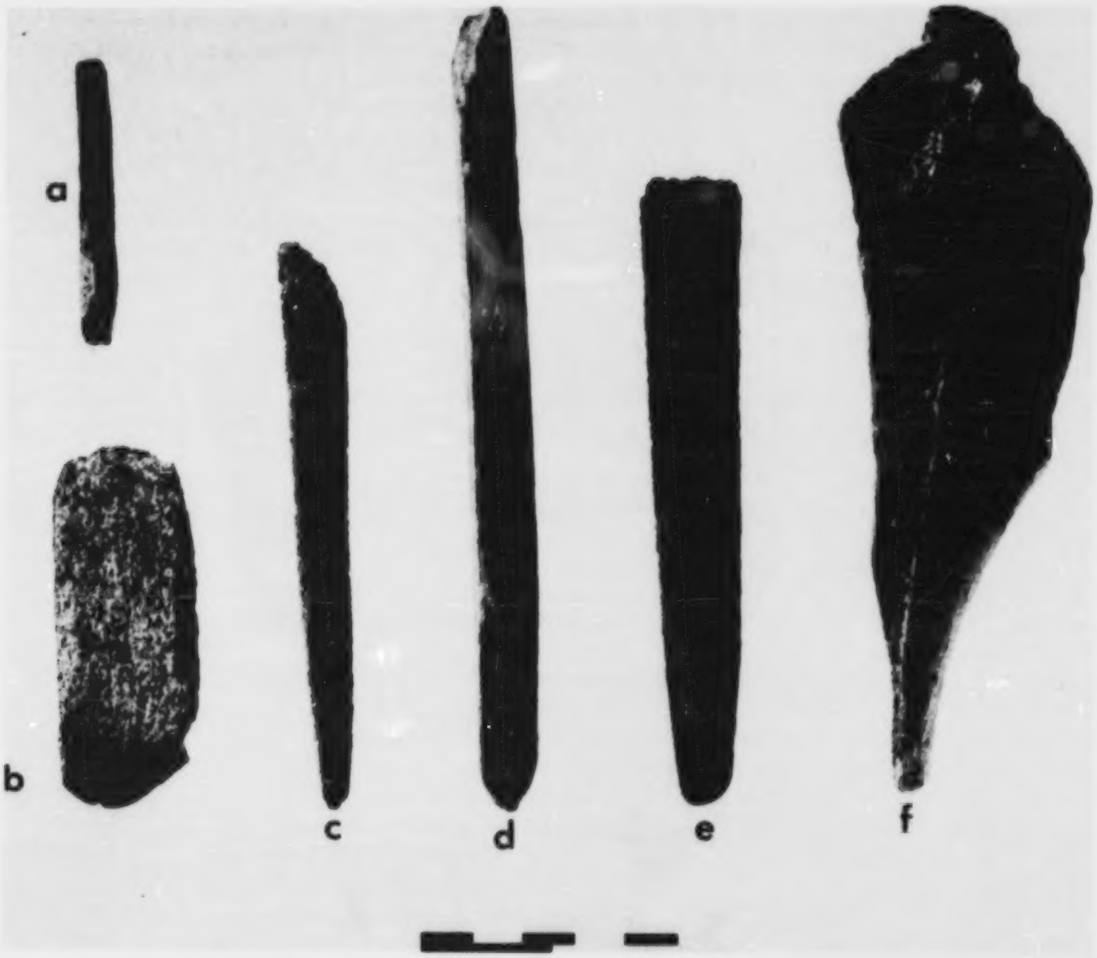


Figure 77. Bone wedges. Tiny wedge: a, 1T3A27A-1588. Broad, flat, thin wedges: b, 1T3B7-584; f, 1T1L4A-5276x. Long, narrow, thick wedges: c, 1T2F21-2366; d, 1T2J5B-1491; e, 1T1X1-3576. (Scale: cm, in.)

The thickest and widest dimensions of the artifact, 5 and 8 mm, respectively, occur just above the ground faces of the bit end. Cross section there is trianguloid. The upper portions of the artifact are rectanguloid in cross section. Both the sides and faces are slightly waisted. The poll is ground flat with the surrounding edges bevelled to reduce splitting or chipping when the poll was struck. The artifact is 56.5 mm long.

Long, narrow, thick wedges. Three artifacts that suggest this shape vary somewhat in shape themselves and therefore are described separately below.

A wedge (Fig. 77d), probably of land mammal bone, was recovered from the upper levels of Zone IIIb. Cross section is rectangular. The proximal end or poll is 13.5 by 10 mm. It appears rough and unfinished; however, projecting surfaces appear compacted from blows. One face tapers inward at about 60 mm from the distal end to form a wedge. The distal end or bit is compacted, shiny from wear and 12 mm wide and 4 mm thick. The bit is straight in end view, and convex in outline, except for a small ragged tuft of bone which has been snapped off. On each side of the tuft are indentations like those of worn saw grooves on the grooved awls. Possibly the bit was made exceptionally narrow and was then snapped off in use, leaving the tuft. The artifact is 156 mm long. The wedge-shaped end, compacted bit and poll and sheen on the faces suggest use as a wedge.

A similar artifact of sea mammal bone (Fig. 77e), without provenience, is oval in cross section. The poll is the widest and thickest part of the artifact, measuring 19 by 15 mm. It bears no evidence of pounding or battering, but the shape and wear of the distal end suggest use as a wedge. At 40 mm from the distal end the faces and sides taper sharply to form a wedge. Cross section here is rectanguloid. This portion and the bit, about 9 mm wide and 3 mm thick, are compacted and worn smooth. The artifact is 121 mm long.

The third artifact (Fig. 77c), from the lower levels of Zone IIa, is also of sea mammal bone. The bit, about 5 mm wide and 1 mm thick, is curved in outline and straight in end view. Cross section is rectangular with slightly convex sides. Width and thickness gradually increase away from the bit, and reach maximum dimensions at the poll. The poll is broken off at a sharp angle and flares outward on one face. The tip of the flared portion appears compressed from blows. Surfaces of all the faces and sides, especially near the bit, are worn smooth and shiny. The artifact is 112 mm long.

Broad, flat, thin wedges. This shape is represented by five artifacts, all of sea mammal bone. They vary considerably in shape and size.

An unusual wedge (Fig. 77f), from Zone IVb is the shaft portion of a northern sea lion radius (Rick 1979). The radius was split longitudinally to form a thin end, almost plano-convex in cross section, in the narrow portion of the radius. The thinned end, which served as thek wedge bit, has broken away, perhaps from attempts to use the artifact as a lever during wedging. The intact side of the radius flares abruptly toward the distal end of the radius, thus providing a natural wedge-shape. The opposite side exposed by splitting also expands toward the distal end of the radius. Most of this side is extremely compacted from pressure and shiny from wear. The wide distal portion of the radius is incomplete. Its projecting surfaces are compacted from blows. The artifact is 152 mm long. The fragmented bit is 24 mm wide and 6 mm thick.

A flat worked fragment of whalebone (Fig. 77b) from Zone IIId was likely used as a wedge. The asymmetrically rounded bit is extremely compressed and shiny from pressure and wear. Projecting surfaces on both faces are also compressed and smooth. The bit is 3 mm thick, and was originally wider than 29 mm. The sides appear fragmentary, so it is difficult to ascertain the width dimensions of the artifact. The body is flat and thin, only 8 mm thick. The poll appears incomplete, but some projecting surfaces are compacted. The artifact is 72 mm long.

A flat, broad whalebone wedge (Fig. 78) from Zone IIb is lenticular in cross section. Maximum dimensions, 28 mm wide and 8 mm thick, occur at the poll. It is broken, but some projecting surfaces show compression. The faces and sides gradually converge in a rounded bit 18

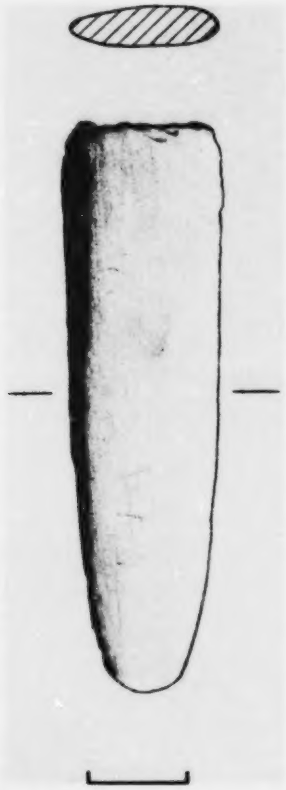


Figure 78. Broad, flat, thin wedge from Zone IIb (1T1J15-2451). (Scale for Figs. 78-80: 0-2 cm.)

mm wide and 5 mm thick. The bit is straight in end view. Its surfaces are compressed and shiny from pressure and wear. Projecting surfaces of the faces and sides are also compressed and worn very smooth. The artifact is 119 mm long.

A similar, but larger whalebone wedge (Fig. 79) from Zone IIIc is roughly tear-shaped in cross section. The broken poll is 39 mm wide by 14 mm thick. Below the poll the sides flare slightly and then gradually taper to a rounded bit 25 mm wide and 5 mm thick. The bit is straight in end view. Its surfaces are extremely compressed. Projecting surfaces of the faces and sides are shiny from wear. The artifact, when intact, was more than 143 mm long.

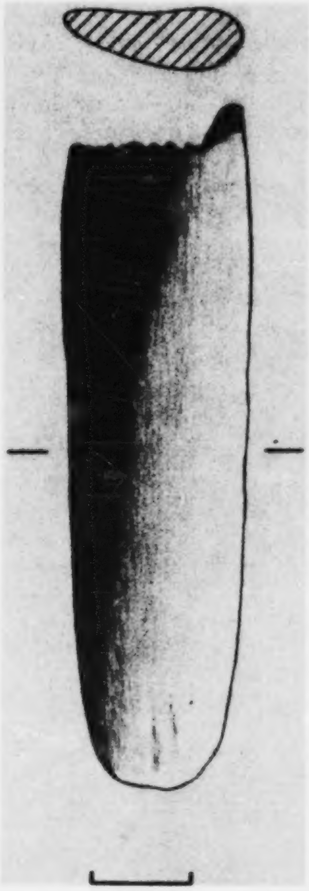


Figure 79. Broad, flat, thin wedge from Zone IIIc (1T1D10-2072).

The fifth wedge (Fig. 80) was recovered from Zone IIIb. One side and the poll have broken away. One face and the remaining side are slightly convex. The opposite face, which contains part of the marrow channel, is concave. The lower part of this face is bevelled at a sharp angle towards the bit, whereas the opposite, convex face is unbevelled. Thus, in side view the wedge-shaped bit is asymmetrical. The bevelled surface and projecting surfaces on the sides and faces are compressed and shiny. The compacted bit is 2 mm thick and was originally more than 23 mm wide. The body is 10 mm thick.

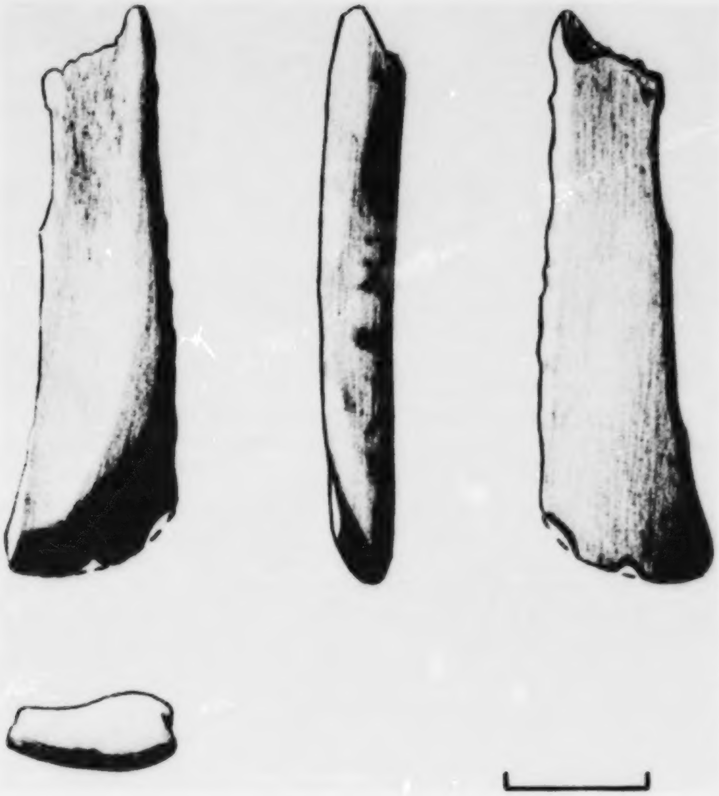


Figure 80. Broad, flat, thin wedge from Zone IIIb (1T1L8A-3523x).

Beaver Incisor Tools

Three beaver incisors (Fig. 81a,b,c) are believed to have been used as cutting tools. They were recovered from Zones IIIc and IVa. The incisors may have been hafted and used as engravers like specimens in Gulf of Georgia sites (Mitchell 1971: 207).

Antler Sleeve Haft

An artifact of elk antler (Cervidae sp.; H. Savage, personal communication) from Zone IVb may have been used as a haft for a chisel or a beaver incisor knife. At one end, a face is bevelled, but the

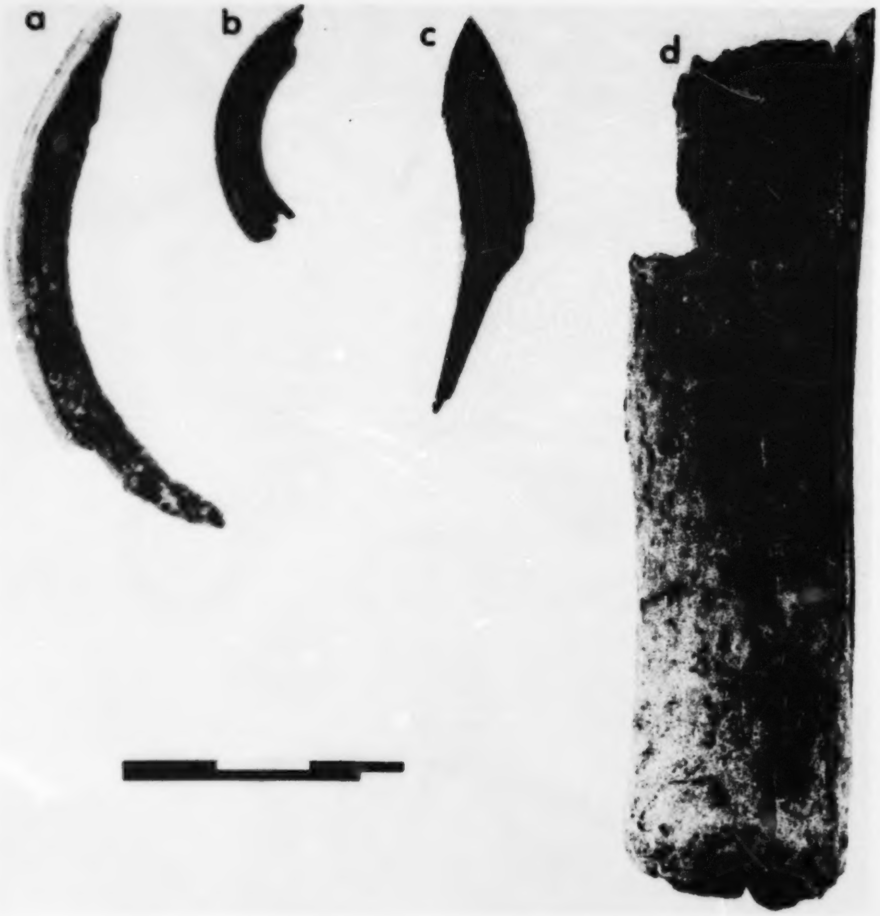


Figure 81. Beaver incisor tools and antler sleeve haft. Beaver incisors: a, 1T2D13-5425x from Zone IIIc; b, 1T1C17-3774x from base of Zone IIIc; c, 1T1D5-3773x from Zone IVa. Antler sleeve haft: d, 1T1K4B-5361x from Zone IVb. (Scale for Figs. 81-99: cm, in.)

opposite face appears unworked and projects irregularly (Fig. 81d); possibly this end was not completed. The other end is bevelled asymmetrically on all edges. The soft cancellous material has been removed throughout the antler to form a roughly lenticular-shaped opening 16 mm wide by 12 mm thick at the bevelled end. The artifact is 96 mm long. The bevelled end is 23 mm wide and 20 mm thick.

No artifacts like this were seen in the ethnographical collections. None appear to have been described ethnographically for the Nootkans. The bevelled end and hollowed centre suggest use as a haft or handle. The artifact resembles antler hafts from the Gulf of Georgia (cf. Mitchell 1971: 211, Fig. 122b).

Cobble Plane

A longitudinal section of cobble (Fig. 82) from Zone IV may have been used as a plane or scraper. The cobble has been fractured on opposite sides to form two opposing flat faces. The resulting sharp edge where one face and the natural surface meet at one end has been worn smooth. Projecting surfaces on the fracture face are also worn smooth. The curved natural surface between the worn edge and the opposite face has been slightly battered. The worn edge and flattened projects, and even the battered end, could have been produced by sliding the artifact across a surface, perhaps as a plane or a scraper. The artifact is otherwise unaltered. The cobble is fine-grained dacite tuff (Donaldson 1970). It measures 97 mm long, 63 mm wide and 30 mm thick. The worn edge is 44 mm wide.

Figure 82. Cobble plane of fine-grained dacite tuff from Zone IV (1T1E4-3635x).

Hammer Tools

Descriptive accounts and word lists of early European visitors to Yuquot indicate at least three types of hammer tools used there in the late 18th century. A "mallet of heavy wood" (perhaps yew) was used for driving chisels (Bayly n.d.). The terms "atshussee" for a "mallet," and "hetso" for "a wooden hammer" were recorded in 1786 by Strange (1928: 50, 52). He also recorded the word "moksee or mooksee" for "a stone hammer, also stones of any kind" (Strange 1928: 50), which suggests that simple, unmodified stones were utilized for hammering and pounding. Other visitors observed that round stones (presumably beach cobbles) were used as hammers (Meares 1791, Vol. 2: 58-59; Jewitt 1896: 124). A third type of hammer was rendered as "punihpunih," a "black beating stone" (Anderson in Cook 1785, Vol. 3: 545), and also noted as "pillukh or pinnukh," "a stone hammer, or pestle" (Strange 1928: 50). This last tool is undoubtedly the pestle-shaped hand maul, known in Nootkan as pinåxpinåx (Drucker 1951: 77).

None of the above tools were seen in the museum collections examined. No remains of wooden tools were found archaeologically; however, a fragment of a pestle-shaped hand maul and what is probably a "moksee or mooksee" were recovered. They are described below as hand mauls and hammer stones.

Hand mauls. A basal half of a hand maul (Fig. 83) was found in Zone IVd. The artifact is of medium-grained basalt (Muller 1979). It

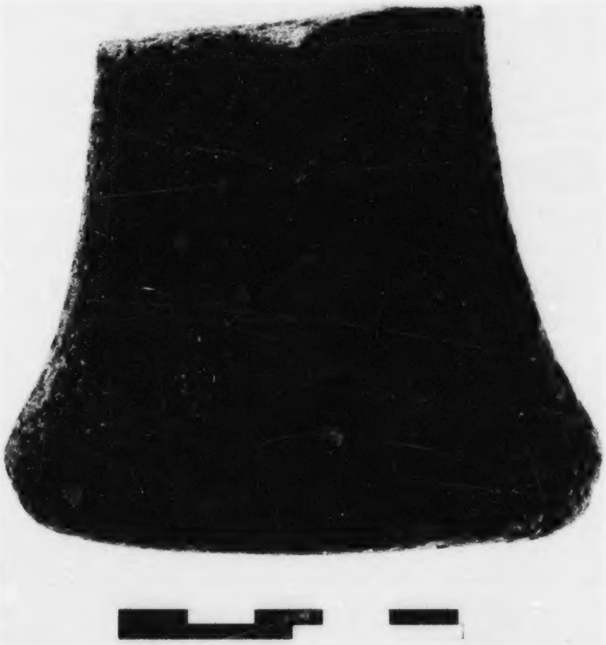


Figure 83. Basal half of hand maul from Zone IVd (1T2F3A-1694).

appears to have been pecked into shape in the manner described by Drucker (1951: 77-78). The striking surface is almost flat, and nearly round in outline. It measures 82 by 72 mm. A bevel approximately 12 mm wide encircles the striking surface at a 40° angle from the plane of the striking surface. Above the bevel, all sides curve gracefully inwards. The broken end of the maul - the middle portion grasped in use - is virtually round in cross section. It is 62 mm in diameter. When intact, the maul was longer than 85 mm. The missing upper portion was probably similar in shape to, but smaller than, the lower half (cf. Boas 1966: fig. 5; Borden 1970: fig. 33z; Hawthorn 1967: fig. 3, #A7321).

Hammer stones. Only one cobble hammer tool was recovered. Many more such artifacts were likely present in both the historic and prehistoric levels of the midden. The absence of more cobble hammers in the sample may be accounted for by two causes. The black midden soil, which became increasingly mud-like as the excavation deepened, would have obscured pitting and other minor alterations to cobbles and pebbles, thereby hindering recognition of them as artifacts. There is also a high probability that tasks involving the use of cobble and pebble tools, particularly heavy woodworking, took place near to or on the beach where such stones are abundant and readily available.

The single cobble artifact (Fig. 84), from Zone IVa, is ignimbrite

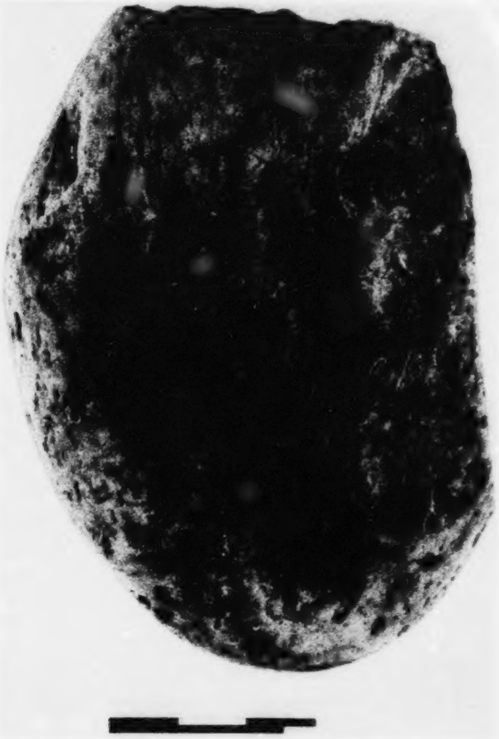


Figure 84. Cobble hammer of ignimbrite from Zone IVa (1T1B3A-3673x).

(Donaldson 1970). The cobble was originally oval in outline and nearly half as thick as it was long. The tip of the rounded end is pitted, probably from pecking or hammering. At the other end, almost half of one face and most of one side have been removed from use. The edge of this end is very battered and may have been used for rough chopping instead of hammering. The altered, relatively flat, side is slightly battered, and may have been used as a striking surface in hammering. The artifact is 102 mm long, 67 mm wide and 44 mm thick.

Cobbles appear to have been used as multi-purpose tools, generally for any task requiring hammering and shaping by pounding, pecking or abrading. Hard cobbles were used to peck out the pestle-shaped mauls (Drucker 1951: 77), and presumably other hard stone tools such as chisel and adze heads which were later abraded smooth. Cobbles appear to have been used in the 18th century to forge iron into adze blades:

> This business they accomplished by main strength, with a flat stone by way of anvil, and a round one which served the purpose of an hammer; and with these instruments they shaped the iron from the fire into a tool bearing some resemblance to a cooper's adze... (Meares 1971, Vol. 2: 58-59).

Cobbles were also used as hammers, abraders and possibly choppers in woodworking:

> Instead of a mallet for striking this [iron bladed] chisel, they make use of a smooth round stone, which they hold in the palm of the hand. With this same awkward instrument they not only excavate their canoes and trays and smooth their planks, but cut down such trees as they want, either for building, fuel, or other purposes... (Jewitt 1896: 124).

Perforators

The classes of artifacts grouped here are categorized as "perforators" in the broadest sense. They likely include tools for which some uses are recorded ethnographically: drills, herring knives, separators of cedar bark fibres and basketry awls. Other probable uses inferred from certain artifact classes are perforation of skins, perforation of bone, removal of marrow from bone cavities and pins or pegs used for composite construction. It is very difficult, owing to lack of ethnographic data, to definitely link any of the above uses with particular shapes. Some nine classes of perforator artifacts, mostly ubiquitous awls, have been defined with uses inferred from shape and wear patterns.

Broad-pointed awls. Thirty-five awls from all four stratigraphic zones have broad tips, rectanguloid in cross section, with sides forming angles of 15 - 30° (Figs. 85, 86; Table 24). The faces of the tips, which diverge considerably less than the sides, range in thickness from 2 to 4.5 mm and average 3.5 mm thick (n=35).

The bones from which the awls are fashioned have been so modified that only five artifacts could be identified regarding element and species (Rick 1979). They were all coast deer elements: two ulnae, two metatarsals and a right acetabular fragment of ilium and ischium. The other awls were identifiable only as land mammal bone.

No artifacts like these were seen in the ethnographical collections. Respondents could not identify the artifacts.

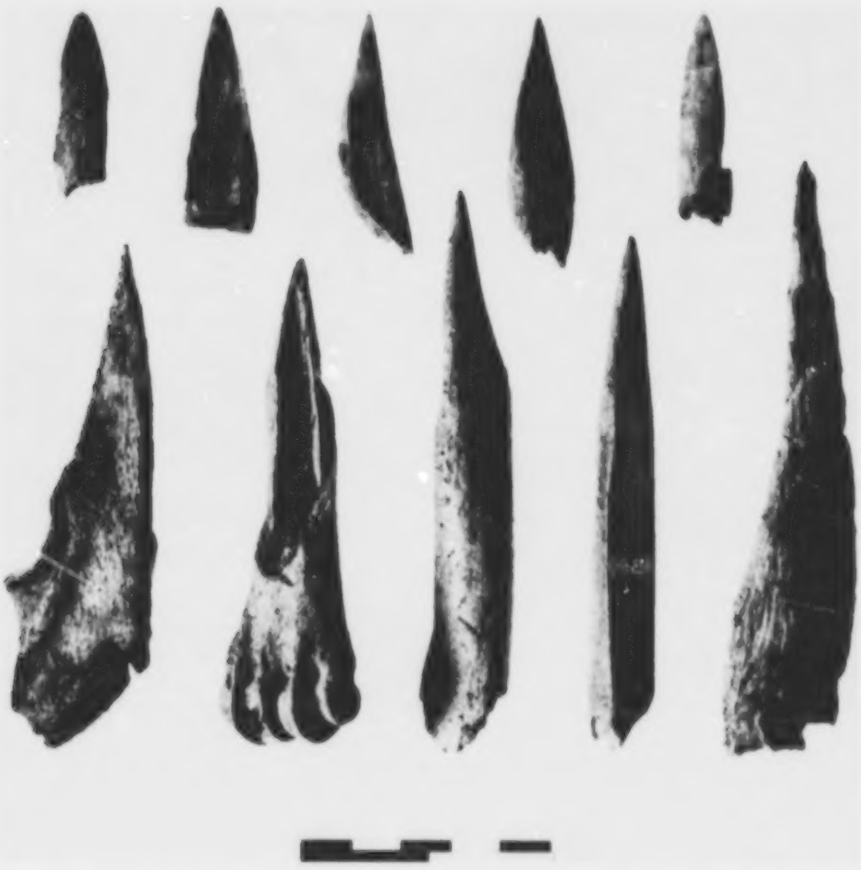


Figure 85. Broad-pointed awls.

Table 26. Broad-Pointed Awls: Proveniences and Artifact Numbers

Zone/Stratum	Artifact No.	Zone/Stratum	Artifact No.
IVa	1T2B6-2863a	IIa	1T3B23A-1135
IVa	1T2D6-2233	IIa	1T1C19A-917
		IIa	1T2C19A-2912a
IIId	1T1A6-322	IIa	1T2C20A-1130
IIId	1T1B10-3786a	IIa	1T2C20A-1134
IIIc	1T3A10-321	IIa	1T2F21-2300
IIIc	1T1B13-2817a	IIa	1T1G17B-2273
IIIc	1T2C13-758a	IIa	1T1J9-2356
IIIc	1T2E12-2999a	IIa	1T1J13-2437a
IIIc	1T1F11-3351a	IIa	1T2J13-2165
IIIc	1T2F13A-2317		
IIIb	1T2G10-3601a	Ib	1T1C33-3639
IIIb	1T2B7A-3429a	Ib	1T2F28B-2483
IIIa	1T2D17-2698	Ib	1T2G25D-2770
IIb	1T1M11A-2196a	no provenience	1T1X1-735
IIa	1T1A19-873		1T1X1-2402
IIa	1T1A26-1365		1T1X1-3040
IIa	1T3A19-929		1T1X1-3202
IIa	1T3B23A-1131		

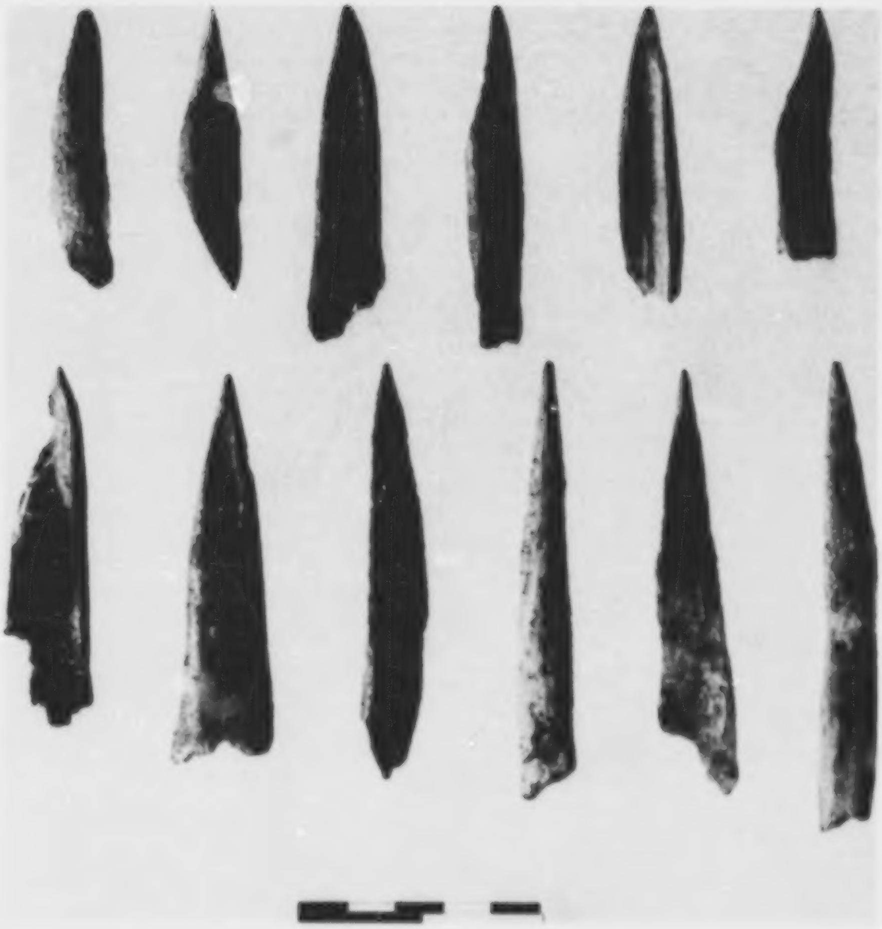


Figure 86. Broad-pointed awls.

Fine-pointed awls. Sixteen awls from Zones II, III and IVa have fine sharp symmetrical tips rectanguloid in cross section (Fig. 87; Table 25). The straight sides of the tips form angles of 10° or less. The faces of the tips form less divergent angles, so that tip thicknesses range from 2 to 3.5 mm. Wear and polish on the tips indicate that from 10 mm to as much as 25 mm of the point was used.

Most of the awls are made from split or sectioned land mammal bone, too modified for identification of element and species. Some awls that could be identified, however, indicate that various species and elements were utilized for these tools (Rick 1979). Three awls are coast deer metacarpals; one, a coast deer ulna; one, an Otariidae fibula; and two are of unidentifiable birds.

Approximately 50 per cent of the fine pointed awls were recovered from Zone IIb (Table 25). This stratum is thought to be a dump for debris from household activities to the west in adjacent stratum IIa.

The awls were probably associated with a residential or household activity. No awls like these were seen in the ethnographical collections. The fine tips, however, are similar in size and shape to the hafted nails used for basketry work by Nootkan women today.

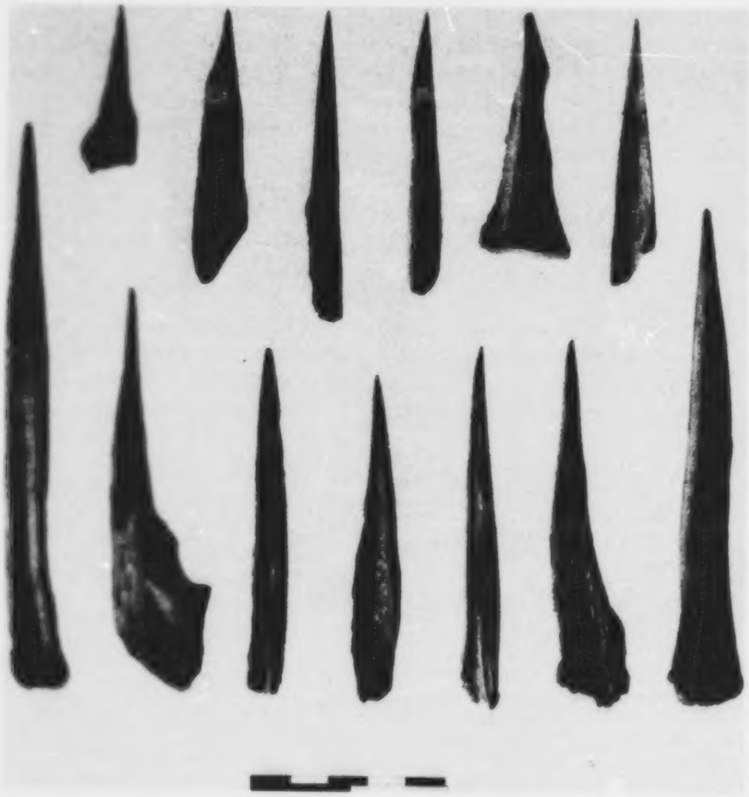


Figure 87. Fine-pointed awls.

Table 23. Fine-Pointed Awls: Proveniences and Artifact Numbers

Zone/Stratum	Artifact No.
IVa	1T1B7-5319x
IIId	1T3A6-2741x
IIIc	1T1D13B-2591
IIIc	1T1F7-1260
IIb	1T1J12-2388
IIb	1T1J13-3465x
IIb	1T1J14-2428
IIb	1T1J19A-2574
IIb	1T2J16-2751x
IIb	1T1L11B-2541
IIb	1T1L12B-2572
IIb	1T1L14B-2602x
IIb	1T1L14C-2643
IIa	1T2A22-1159
IIa	1T1B20-823
no provenience	1T1X1-3088

Fine-pointed awls with shoulders. Five awls from Zones II and IIIc have fine points with opposing shoulders near the point (Fig. 88). The points are very sharp and fine, with the sides forming an angle of 10° or less. Thickness ranges from 2 to 3.5 mm. In cross section the points are rectanguloid, with rectangularity increasing toward the shoulders. Wear and polish indicate that no more than 10 mm of the point appears to have been used. Four awls are modified ulnae, and one is a split right metacarpal, all of the coast deer (Rick 1979). Proveniences and specimens are as follows:

Zone/Stratum	Artifact No.
IIIc	1T1D16A-2594
IIIc	1T1E8-2968x
IIb	1T1J13-3466x
IIb	1T2J15-2194
IIa	1T1C24-1556x

Because use appears to have been confined to within 10 mm of the tip, the shoulders may be more a result of shaping than functional intent. Therefore, it may be more correct to view this class of awl as a

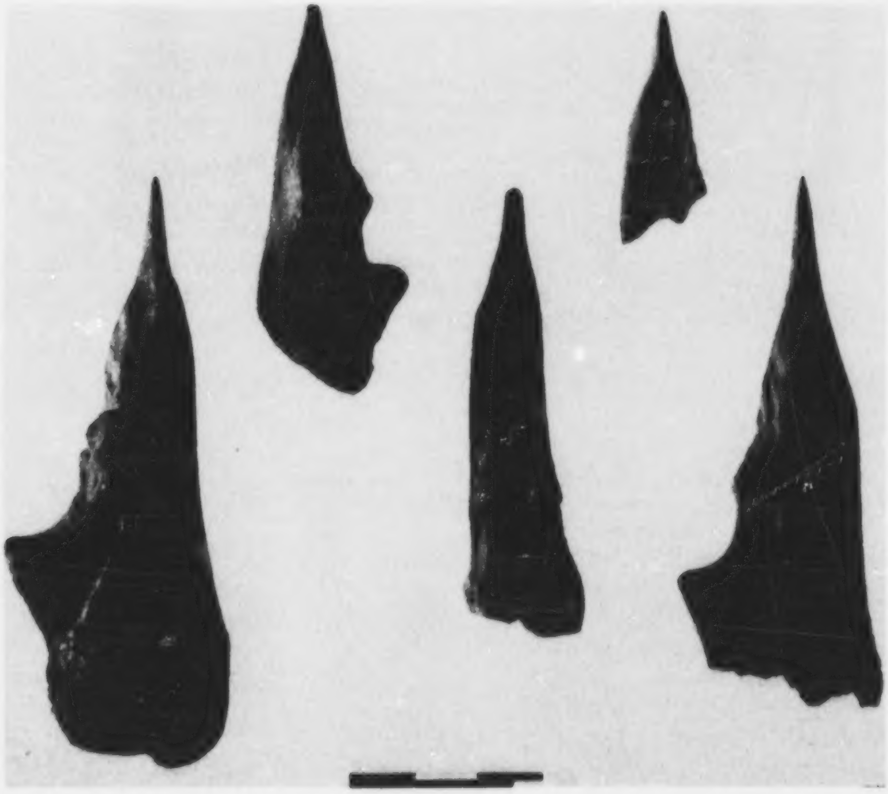


Figure 88. Fine-pointed awls with shoulders.

stylistic variety of the fine-pointed awls, as their shapes and sizes are so similar. Again, the extremely fine tips may have been used for fine basketry work.

Grooved awls. Fifty-two awls from all four zones have distinctively grooved tips (Figs. 89, 90; Tables 26, 27). The tips are rectanguloid to oval in cross section. Each tip, within 20 mm of its end, bears from a few to 10 or more fine transverse grooves less than 0.5 mm wide. The grooves cut across part of one or both faces and adjacent sides at the "corners" of the cross section. When two sets of grooves are present, they are usually at opposing corners, diagonal to each other in terms of the oval or rectanguloid cross section. The grooves are usually preceeded by a narrowed, but slightly bulbous or expanding point from 8 to 12 mm long. The size and shape of the point and grooves vary somewhat by cross section. This may reflect a functional difference, so the grooved awls are subdivided into those with flat cross sections and those with round cross sections.

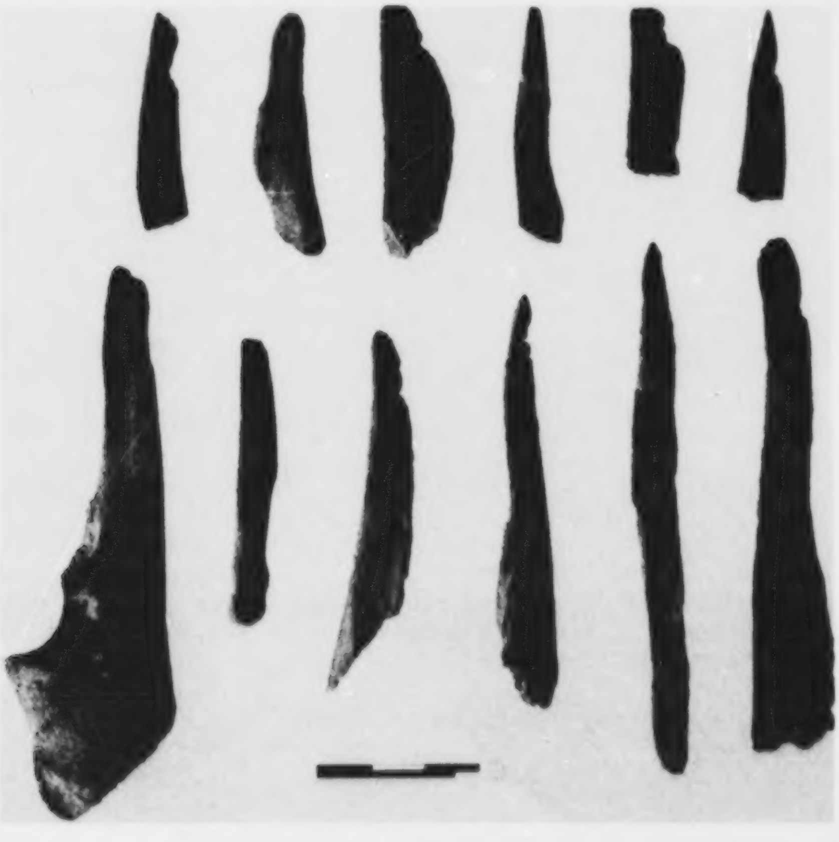


Figure 89. Grooved awls with flat cross sections.

Grooved awls with flat cross sections. Thirty grooved awls have flat to rectanguloid cross sections (Fig. 89; Table 26). Most tips are so worn that the ends are not well defined. Intact ends, however, vary in shape from very pointed to almost spatulate. All projecting surfaces of the grooved areas are worn. The more shallow the groove, the more wear within it. Some grooved surfaces are so worn that they are a series of scar-like impressions. Most grooves are part of a deep indentation in one side for one-quarter to one-half the width of the artifact. This indentation sets off a blunt, expanded point. The edge of the side opposite the deeply grooved area is often slightly grooved or slightly indented. Wear polish on the faces and sides often extends beyond the grooved area for 20 - 30 mm from the tip of the artifact.

Table 26. Grooved Awls with Flat Cross Section: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Point Length	Point Width	Point Thickness
IVb	IT2G5-3393x	15	7	2
IVb	IT2K4B-3513x	12	7	2
IVb	IT1L4A-1756	12	5	2
IIId	IT3A8-2747x	11	5	2
IIIc	IT1B15B-2826x	-*	5	2.5
IIIc	IT1C15B-2878x	15	9	2.5
IIIc	IT2C12-2900x	17	9	2.5
IIIc	IT3C17A-2933x	12	5	2
IIIc	IT1D17A-2950x	14	6	2
IIIc	IT1E12-2973x	-*	7	2.5
IIIc	IT2E8-2989x	-*	5	2
IIIc	IT2E11-3825x	13	6	2
IIIb	IT1H10-1560x	10	6	2
IIIa	IT2F12C-3369x	13	8	2
IIa	IT3A23-2807x	9	5	2
IIa	IT3B23A-1128	13	5	2
IIa	IT3C19A-2936	12	6	2.5
IIa	IT2E14A-3806x	-*	6	2
IIa	IT1F17-2141	8	4	2
IIa	IT1G18-2369	12	6	2.5
IIa	IT1H12-5372x	9	7	2.5
IIa	IT2H11-2325	-*	7	3
IIa	IT1K14B-3509x	-*	6	2
IIa	IT3N7A-3544x	13	5	2
IIb	IT2H18A-2412x	-*	5	2
IIb	IT2J16B-3757x	-*	6	2
no provenience	IT1X1-3109	-*	5	2
	IT1X1-3114	-*	8	2
	IT1X1-3132	-*	5	2
	IT1X1-3158	10	5	2.5

* Incomplete.

Dimensions of the flat grooved awls measured from the last proximal grooves which are part of the side indentation to the distal end (Table 26) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
point length	8-17	12.1	2.3	19
point width	4-9	6.0	1.3	30
point thickness	2-3	2.7	0.3	30

Skeletal and species identification of the flat grooved awls shows a marked preference: 24 are coast deer ulnae, 1 is a coast deer metacarpal and 5 are of unidentifiable land mammal (Rick 1979).

The use of the flat grooved awls is not known. The high polish on the faces and edges indicates that the awls had contact with an enclosing surface. The worn grooved indentations may have served to catch material being worked. Possibly the artifacts were used as weaving tools, inserted into a weave to catch weft fibres and tamp them down.

Grooved awls with round cross sections. Twenty-two grooved awls have oval to round cross sections (Fig. 90; Table 27). Sides and tips resemble those of the flat grooved awls, but are thicker.

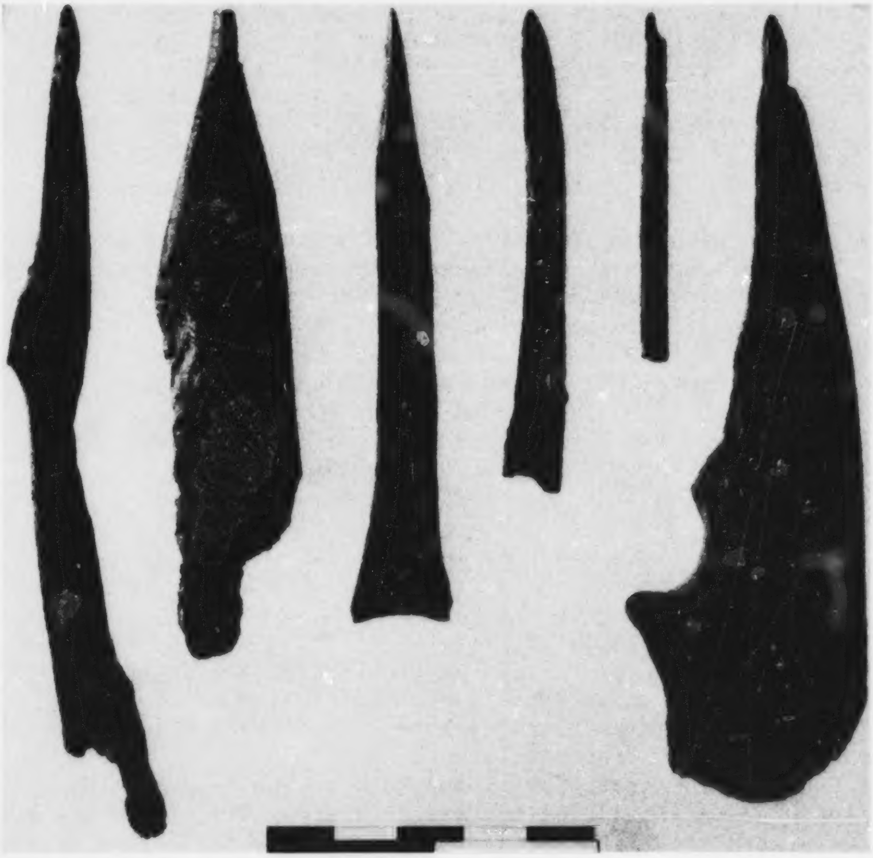


Figure 90. Grooved awls with round cross sections.

Indentations produced by the grooves are frequently not as deep. The points set off by the grooves range in shape from rounded and blunt to

Table 27. Grooved Awls with Round Cross Section: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Point Length	Point Width	Point Thickness	Angle (°) of Point Sides
IVa	IT1D8-2046x	12	5	3	15
IIId	IT3A8-2853x	13	5	3	15
IIIc	IT2C12A-1145	11	5	3	15
IIa	IT1A22-1551	-*	5	3	10
IIa	IT1A25A-1576	11	4	3	10
IIa	IT2A22-1170x	9	6	3	15
IIa	IT2A24-1571	9	4	3	10
IIa	IT2C22-1154	12	5	3	10
IIa	IT3C26-2940x	10	6	2	15
IIa	IT2E20-2093x	5	3	3	10
IIa	IT2F21-2370	10	6	3	20
IIa	IT1H19-3836x	9	4	3	10
IIb	IT2J17B-2760	14	4	3	10
IIb	IT2K15-3518x	10	4	4	10
IIb	IT1L12B-2576x	13	5	4	15
Ib	IT3B26B-1190	-*	5	4	15
Ib	IT3C27B-1092	11	5	3	15
Ib	IT1C32-2692	12	4	3	15
Ib	IT1E29B-2647	10	4	4	10
Ib	IT2F30B-2520	10	3	2	10
no provenience	IT1A-2662	12	6	4	15
	IT1X1-3010	14	5	3	15

* Incomplete.

relatively sharp with straight sides. The points, grooves and proximal areas of the shaft are highly polished with wear. Dimensions measured from the last proximal grooves which are part of the indentation to the distal end (Table 27) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
point length	5-14	10.9	2.1	20
point width	3-6	4.7	0.9	22
point thickness	2-4	3.1	0.6	22

Skeletal and species identification of these artifacts did not reveal a marked preference for any particular species or element owing to a large proportion of unidentifiable modified bones: 16 unidentifiable land mammal bones, 1 bone of uncertain class, 2 coast deer ulnae and 3 coast deer metatarsals.

The use of these artifacts is not known. The rounded cross sections and less-defined tips may indicate a variety of weaving tool used in a related or similar manner to that suggested for the grooved awls with flat cross sections.

Wedge-tipped awls. Ten awls from Zones III and IVb terminate in small wedge-shaped tips rectanguloid in cross section (Fig. 91; Table 28). In outline, the sides are either parallel or taper to an excurvate edge. It is formed by the meeting of two opposing bevels, one on each face 2 - 4 mm from the edge. One specimen is bevelled only on one face. The edges of six tips are worn or sharpened asymmetrically.

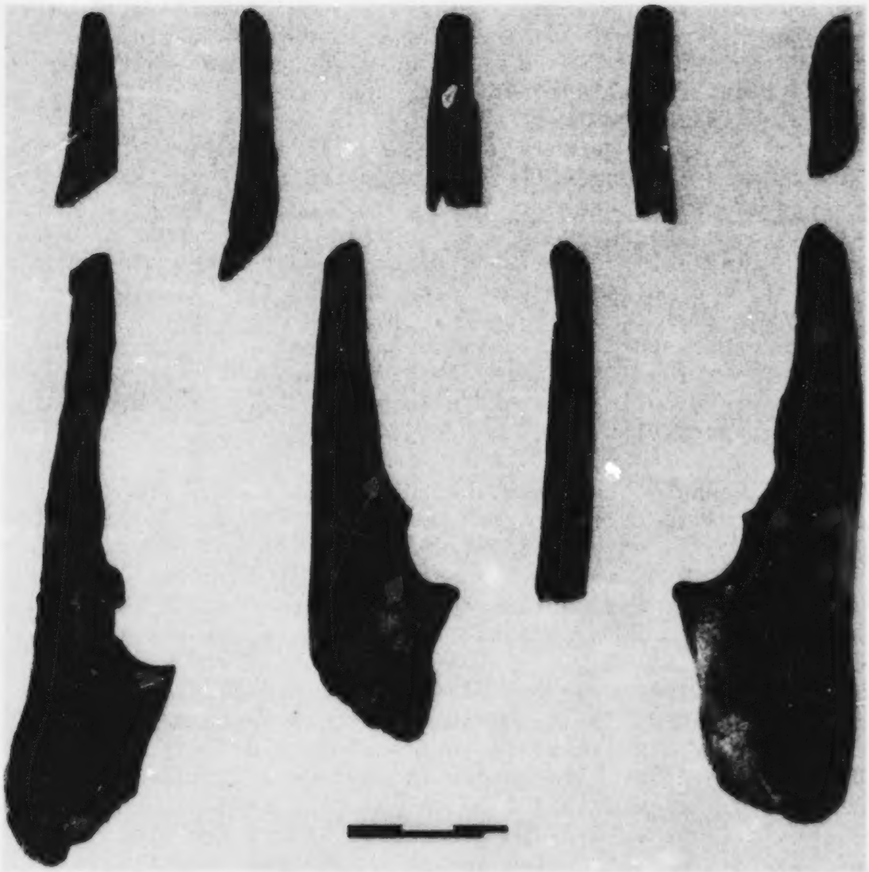


Figure 91. Wedge-tipped awls.

Table 28. Wedge-Tipped Awls: Proveniences and Measurements (mm)

Zone/Stratum	Artifact No.	Tip Width	Tip Thickness
IVb	1T2G5-3392x	7	3
IIId	1T1B10-5316x	6	2
IIIc	1T1B12-2815x	7	3
IIIc	1T1B12-5299x	8	2
IIIc	1T3B11-5302x	8	3
IIIc	1T3C13B-3801x	8	2
IIIc	1T1E10-2970x	9	3
no provenience	1T1X1-3077	8	2
	1T1X1-3123	8	2
	1T1X1-3243	8	3

The tips are remarkably similar in width and thickness (Table 28). Width ranges from 6 to 9 mm, and averages 7.5 mm; thickness, from 2 to 3 mm, averaging 2.5 mm (n=10). The bevels average 3 mm wide.

Seven wedge-tipped awls are modified ulnae of the coast deer; one is a modified right rib of a coast deer; and two are of unidentifiable land mammal bone (Rick 1979).

The use(s) of these awls is not known. It is unlikely that the artifacts were used as wedges like the modified ulnae of the Roosevelt elk (Cervus canadensis roosevelti Merriam) in Gulf of Georgia sites, because the tips are not compacted enough, and the proximal ends of the three complete ulna awls do not show signs of battering. Instead, the wedge-shaped tip and polish on the faces suggest that the awls were inserted into material to separate it. A knife of deer ulna or seal rib was used by women to start splits for separating strips of red cedar bark (Drucker 1951: 95). No tools identified as such seem to have been collected ethnographically, so that a comparison with the archaeological specimens is not possible.

Other awls. Sixteen awls or awl-like tools that do not fit well into the above classes may be extreme examples from some of the classes. For example, five artifacts with wedge-shaped tips may be related to the wedge-tipped awls. Two fragmentary artifacts may have been fine-pointed awls. Other artifacts are unusual specimens occurring in too few numbers for classes to be apparent. The artifacts are described separately below.

A deer antler tine from Zone IIa has been modified as a tool (Fig. 93e). Its curved tip is ground at a sharp angle on the excurvate face and slightly on the incurvate face and one side to form symmetrical sides. These converge at a 15° angle to an edge slightly curved in outline. It is 3.5 mm wide and 1 mm thick. The slightly convex faces and sides form a rectanguloid cross section. Apart from the distal tip and broken proximal end, the tine is not appreciably modified.

A portion of fractured land mammal bone, from Zone IIa, terminates in a wedge-shaped tip lenticular in cross section and excurvate in outline (Fig. 92 f). It is 7 mm wide and 4 mm thick.

A wedge-tipped artifact of sectioned land mammal bone (Fig. 92i), from Zone IIa, is likely an awl, because it does not bear the impacted tip and battered poll of the wedges. The tip, 10 mm wide by 5 mm thick, tapers to a slightly excurvate edge 6 mm wide.

A thick wedge-tipped artifact based on split and chopped land mammal bone (Fig. 92e) was recovered from Zone IIa. The tip, 7 mm wide by 6 mm thick, tapers abruptly to an edge 3 mm wide.

A complete artifact of land mammal bone, from Zone IIIa, is plano-convex in cross section (Fig. 92c). The convex face is the naturally curved surface of the split bone. The plane face is ground flat across, but upturned at each end. Both ends are wedge-like and slightly convex in outline. The artifact is 82 mm long, 20 mm wide and 7.5 mm thick. The upturned wedge-like ends suggest a flesher.

A similar, but fragmentary artifact of split land mammal bone (Fig. 92a) was found in Zone IIIc. Cross section is concavo-convex. The convex face is the naturally curved cortex; the concave face, the bone cavity. The tip is ground into a sharp wedge-shaped edge, excurvate in

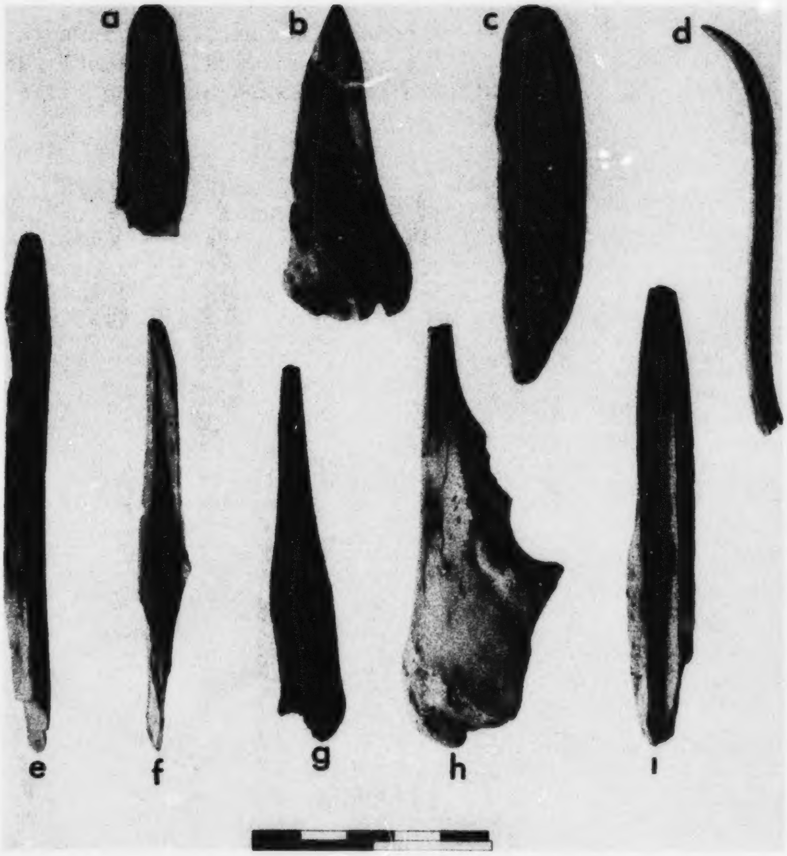


Figure 92. Miscellaneous awls: a, 1T3B15-787 from Zone IIIc; b, 1T2J16-2696 from Zone IIb; c, 1T1C17-872 from base of Zone IIIc; d, 1T3A20-1097 from Zone IIa; e, 1T1J18A-2513 from Zone IIa; f, 1T3A16A-892 from Zone IIa; g, 1T2K11A-2554 from Zone II; h, 1T1X1-3127; i, 1T3B21A-949 from Zone IIa.

outline and slightly curved in profile. The broad, sharp upturned wedge-like tip suggests use as a flesher.

A complete artifact from Zone IIb (Fig. 92b) resembles the broad-pointed awls, but is too broad and thin to be included with them. The tip is a bifacially ground, thin sharp point with symmetrical sides forming an angle of 45°. Each face is ground in two bevels that form a slight ridge down the middle of the face. In cross section, the tip is very thin and rectangular. Most tip surfaces are still covered with abrasive striae which indicate little use of the artifact. It makes a slit-shaped perforation. The artifact is based on the proximal one-third of the left radius of the coast deer (Rick 1979).

Two artifacts, one from Zone II (Fig. 92g) and the other without provenience (Fig. 92h), have broken tips which did not allow them to fit into the awl classes. Both tips are ground into long fine points with

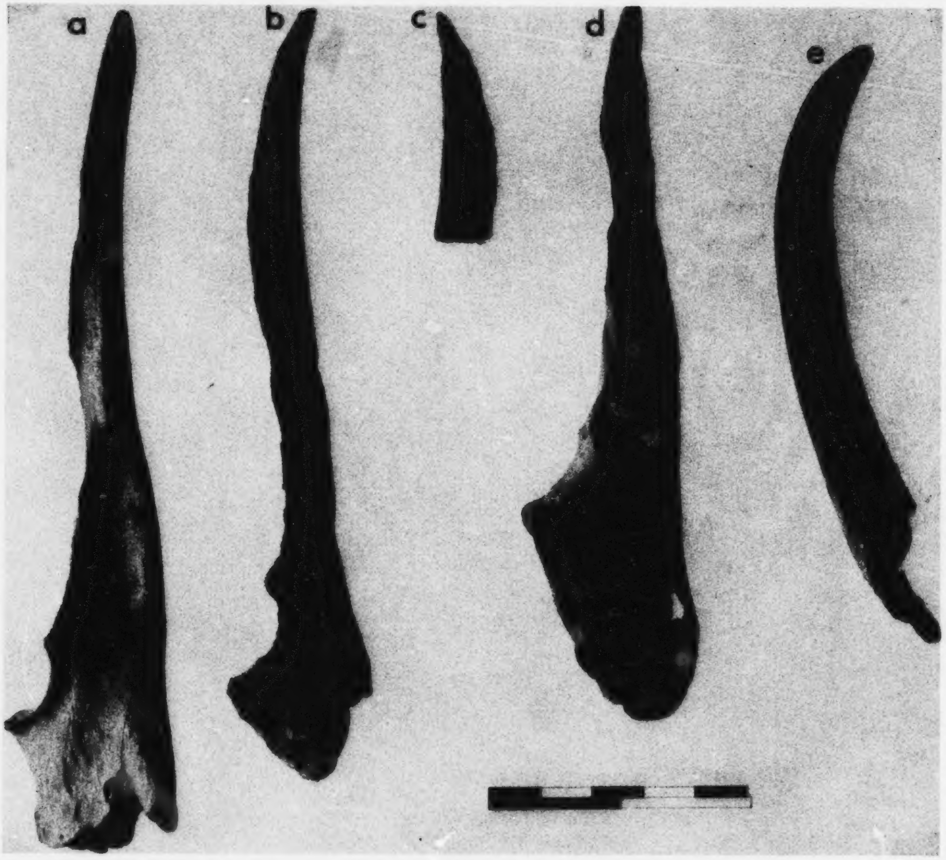


Figure 93. Miscellaneous awls. Sharpened coast deer ulnae: a, 1T2E14A-3333x from Zone IIa; b, 1T1L9A-2544 from Zone IIa; c, 1T3A29-2259x from Zone Ib; d, 1T2K4A-3512x from Zone IVb. Antler tine awl: e, 1T3A27A-1587 from base of Zone IIa.

sides forming angles of about 5°. Cross sections are rectangular. These specimens may have originally been fine-pointed awls.

Four ulnae of coast deer (Fig. 93a-d) from Zones Ib, IIa and IVb, have distal ends sharpened into long, bluntly pointed tips. Tip cross sections are flat and rectanguloid. The thin distal posterior edge of the ulna is shiny from wear. This tip shape and wear suggest insertion and slitting. These artifacts may be ulna fish knives, such as reported ethnographically (Drucker 1951: 91).

An unusual artifact from Zone IIa (Fig. 92d) is a slightly modified baculum of a large raccoon (H. Savage, personal communication). The curved distal end tapers to a sharp point which appears to have been blunted and polished from use.

Two sharpened whole bird bones may be awls. One, without provenience, is a carpometacarpus of the short-tailed albatross

(Fig. 94j); the other, from Zone IIIc, is a proximal radius of a large gull (Larus sp.) (Fig. 196a) (N. McAllister, personal communication).

Drills. Two artifacts of dense land mammal bone are believed to have been the bits of drills or a similar perforating device. One artifact (Fig. 94b) was recovered from the interface of Zones Ib and IIa, the other (Fig. 94a), from Zone IIIc.

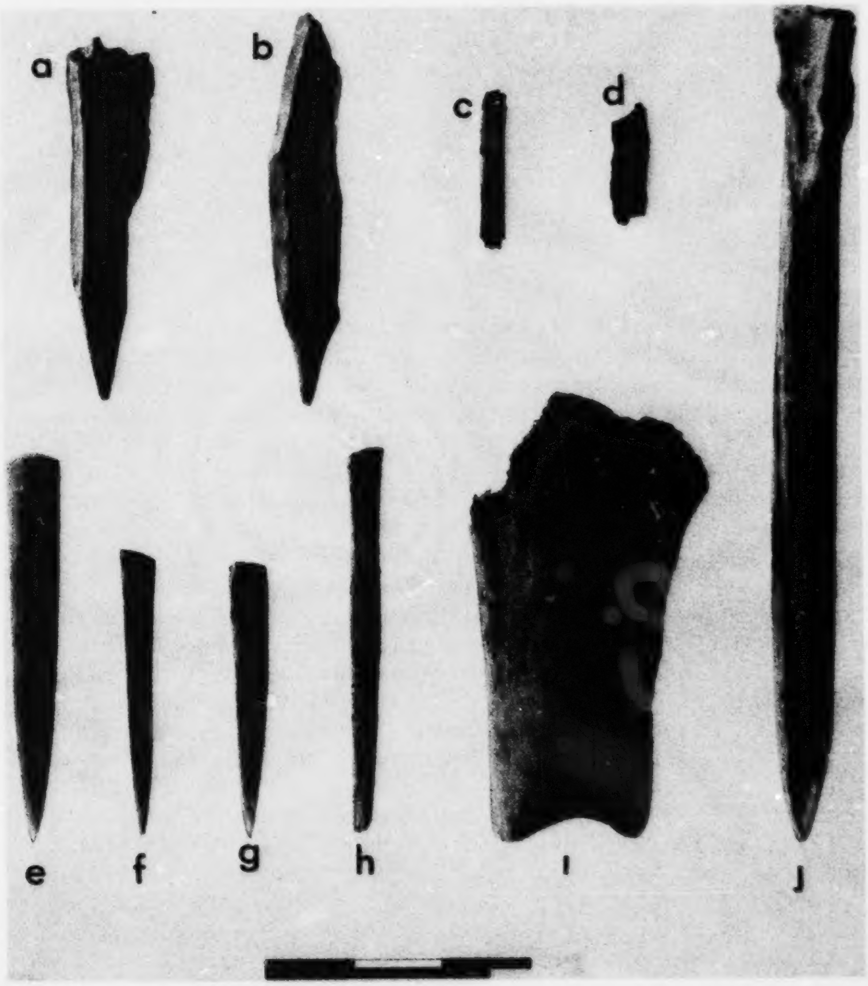


Figure 94. Miscellaneous perforators. Probable drills: a, 1T1B16A-786x from Zone IIIc; b, 1T1J20D-2614 from Zone Ib. Fragment of fish spine perforator: c, 1T2E3-5385x. Fragment of metal perforator: d, 1T2E3-5386x. Bone punch or arming point: e, 1T1X1-3130. Unbarbed points with flared proximal ends: f, 1T2H13B-2340x; h, 1T1X1-2664. Bone punch or pin: g, 1T1X1-3195. Possible bone gouge: i, 1T1D13-2523 from Zone IIIc. Bird bone awl: j, 1T1X1-3085.

Both artifacts have distinctively shaped(?) and worn pointed ends. The proximal portion of the end is a shoulder rectanguloid in cross section. The sides and faces taper symmetrically from the shoulder to form a straight-sided point of about 10°. Point cross section is rectanguloid, becoming increasingly oval and round toward the tip. Point surfaces, particularly those of corners near and at the shoulder, bear heavy horizontal striae from wear. Point surfaces are smooth and polished from wear. Other sides, faces and end of the artifacts are unfinished surfaces left from spiral fracturing and splitting. There is no shaping to facilitate hafting.

The worn pointed ends on both artifacts have remarkably similar dimensions, as listed below. Point length is from the shoulders to tip; point width, across the shoulders; and point thickness, at the shoulders.

Artifact No.	Point Length (mm)	Point Width (mm)	Point Thickness (mm)
1T1B16A-786x	12	6.5	4
1T1J20D-2614	11	7.0	4

The strong horizontal striae on corners and against the shoulders indicate that the artifacts were pressed into an enclosing surface and turned with pressure toward the distal end. Such a wear pattern could have been produced if the artifacts were used to bore conical perforations. It cannot be determined whether the artifact was used alone, or if it was the hafted bit of a composite drill. Nootkan drill bits were apparently ground to "an abrupt square point" (Drucker 1951: 79). Considerable wear on such a point might produce a shape like that of these artifacts.

Bone punch. A complete artifact without provenience appears to be a small punch of land mammal bone (Fig. 94g). Cross section is rectanguloid. Maximum width and thickness are at the proximal end, from which the straight sides taper to a very sharp distal end. The proximal end is compacted and cracked from being struck, which suggests use as a punch or peg. The artifact is 32 mm long, 4 mm wide and 4 mm thick.

Whole bone gouge(?). A curious gouge-like bird bone (?) artifact (Fig. 94i) was recovered from Zone IIIc. The articulatory end of the bone has been largely removed to expose cancellous tissue. The other, open end was originally worn on all edges. The edge is not bevelled. The hollow, inner surface of the bone is barely worn, in contrast to a well-worn and highly polished outer area about 3 mm wide along the edge. The edge is 2 mm thick; the worn end is 18 mm wide and 12 mm thick. The artifact is 51 mm long.

The artifact is too fragile to have been used as a gouge in woodworking. It is peculiar that all the edges were originally worn. The artifact was perhaps a perforator of some sort.

Dogfish dorsal spine artifacts. Numerous dorsal spines of the dogfish shark, Squalus acanthias, are found in coastal middens.

Archaeologists have noticed wear on some spines, and suspected that it may have been produced from using the spine as an artifact. The naturally extreme sharpness of the spines might have made them readily useful as perforators, awls, or other artifacts. Ethnographic data on the spines are unfortunately absent. Little seems to be known of the function of the spines on the dogfish, and how they incur wear naturally. An attempt was made to recognize and define possible dorsal spine artifacts in the Yuquot material.

The spines on six dogfish sharks in the National Museum of Natural Sciences were examined for comparison with the Yuquot dogfish spines. The dogfish has two spines, each projecting from the anterior base of the dorsal fins (Hart 1973: 44). The spines curve posteriorly, and grow very closely to the anterior edge of the dorsal fins. The spines are trianguloid in cross section; the "apex" and two long sides are the anterior of the spine. The exposed anterior surfaces bear a thin, shiny enamel with horizontal ribbing. The enamel is purple near the base of the spine and becomes increasingly lighter in colour toward the tip. The enamel terminates along the posterior edges ot the spine. There, unenamelled cartilage forms a rounded edge and a middle posterior groove running the length of the spine. The young dogfish have short, very sharp, fine spines. The old dogfish have large sturdy spines, slightly rounded and blunt at the tip. The tip of one spine on a young shark was slightly ragged, but unlike any of the archaeological spines. Only one of the 12 spines examined had several parallel horizontal nicks in the enamel across one posterior edge. What produced these is not known. Presumably the spines protect the dorsal fins from bumps against rocks and other hard objects. If this is so, then older sharks, which can live up to 40 years (Hart 1973: 45), have good probability for incurring considerable wear on their spines.

A total of 9523 spines was recovered from Yuquot as follows: Zone I, 71; Zone II, 3966; Zone III, 2031; Zone IV, 3452; and no provenience, 3. Nearly 1000 of these spines appears to have been worn or altered. Examination at 16 times magnification under a binocular microscope revealed that many spines had horizontal nicks in the enamel, similar to those on the dogfish. The anterior surfaces sometimes showed scratches, dents, chips and various striae. Although these were not observed on the six dogfish, there is a strong possibility that at least some of this wear occurred in nature. Therefore, in determining probable artifacts, horizontal nicks and scratches on the anterior surfaces alone were rejected as attributes. Many spines, however, also had nicks, scratches, striae, and sometimes chips on the unenamelled posterior edges and groove. The extremely close proximity of the posterior surfaces to edge of the dorsal fin would probably protect them from damage. Hence, wear on the posterior surfaces of the spine was thought to be unnatural, likely from use as an artifact.

A total of 111 spines, from Zones II, III and IV, was selected as probable artifacts (Fig. 95; Table 29). Most have deep horizontal scratches and nicks in the projecting posterior edges; some also have corresponding nicks on the anterior ridge. A few worn tips are chipped on the posterior surface. Many spines bear deep vertical and diagonal scratches on the anterior surfaces of the tip. The anterior sides of the proximal ends, originally inside the dogfish body, are pinched

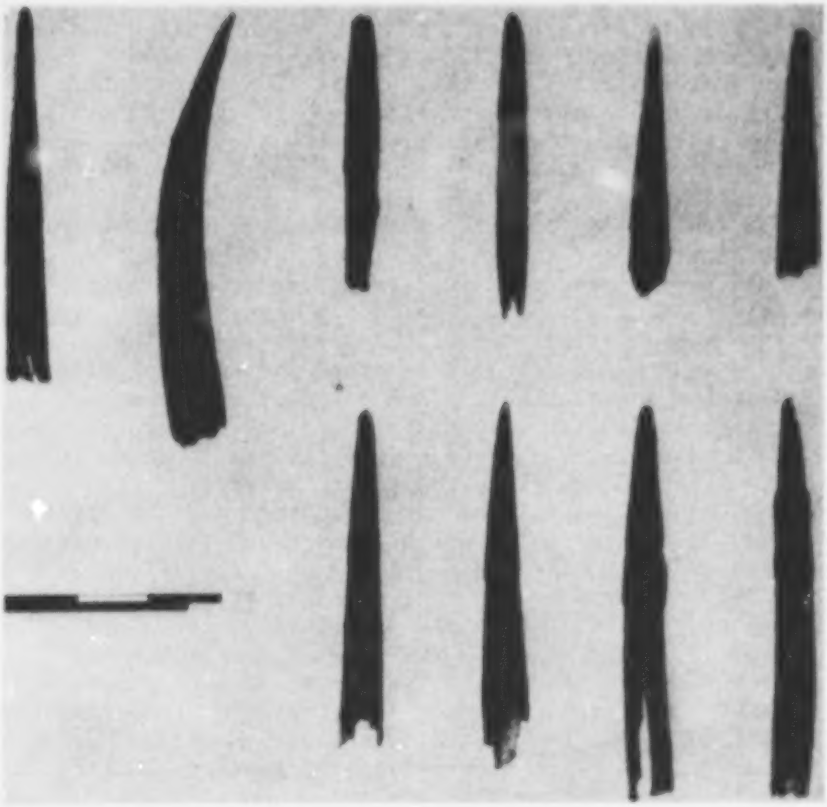


Figure 95. Dogfish dorsal spine artifacts. Anterior and lateral views are shown in upper left. All other surfaces shown are posterior.

Table 29. Probable Dogfish Dorsal Spine Artifacts: Proveniences and Artifact Numbers

Zone IIa		Zone IIb	Zone IIIb	Zone IIIc		Zone IIId
IT1A19-5148a	IT2A21-5178a	IT1J20C-5177a	IT1J3-516a	IT1A14-5133a	IT2E13-5142a	IT1A30-5188a
IT1A20-5130a	IT2A22-5167a		IT1J9-5204a	IT1A14-5135a	IT2E13-5196a	IT1A4A-5157a
IT1A22-5216a	IT2K12A-5131a		IT2G8B-5159a	IT1B13-5124a	IT2F7B-5241a	IT1A4B-5208a
IT1A22-5218a	IT3A20-5137a		IT2J3A-5217a	IT1C10-5229a	IT2G8-5141a	IT1A9A-39a
IT1A22-5220a	IT3A22-5223a		IT2J3D-5126a	IT1E7-5139a	IT3A9-5187a	IT2C8-5190a
IT1C20A-5199a	IT3A23-5134a		IT2J3D-5127a	IT1F8-5146a	IT3A13A-5209a	IT2C8-5191a
IT1C22-5125a	IT3B17-5123a			IT2A14A-5160a	IT3A19B-5182a	IT2C8-5193a
IT1C24-5130a	IT3B23A-5175a			IT2B10-5182a	IT3B8-5129a	IT2C8-5197a
IT1H12-5185a	IT3C18A-5200a			IT2B10-5236a	IT3B10-5239a	IT3C8-5156a
IT1H14B-5140a	IT3C19A-5122r			IT2B11-5143a	IT3C11-5128a	
IT1L10-5179a	IT3C21-5188a			IT2E10-5176a	IT3C11-5213a	
IT2A19-5145a	IT3C22-1123a			IT2K11-5181a	IT3C15-5152a	
IT2A20-5169a	IT3C22-5136a			IT2K11-5183a		
IT2A21-5224a	IT3C22-5138a					

Zone IVa	Zone IVb	Zone IVc	Zone IVd		No Provenience
IT1B3-5203a	IT1J4B-5189a	IT1F5-5168a	IT1A1-5234a	IT1G4-5165a	IT1F-5262a
IT1C6-5206a	IT1J4B-5219a		IT1A2-5169a	IT1G5-5162a	IT1E1-2784
IT1C7-5202a	IT2J2-5240a		IT1B1-5126a	IT1H2-5147a	IT1E1-5151
IT1C7-5225a	IT2K3A-5161a		IT1B1-5227a	IT2B1B-5235a	
IT1C7-5231a	IT2L2A-5156a		IT1B1-5228a	IT2B2C-5221a	
IT1E3A-5163a			IT1C1-5174a	IT2E3-5197a	
IT2B4A-5172a			IT1C3-5132a	IT2F3A-5246a	
IT2B4A-5173a			IT1E2-5243a	IT2G2-5201a	
IT2C7-5153a			IT1F6-5144a	IT2G3-5134a	
IT2C7-5211a			IT1G2-5242a	IT2G3-5135a	
IT3C7B-5198a			IT1G3-5170a	IT3C1-5205a	

together on 35 spines. Perhaps this resulted from holding them.

The vertical scratches and chipped tips suggest that the spine was forced directly into an object, perhaps to make a puncture. Horizontal nicks and scratches in the projecting posterior edges and anterior ridge could have been produced by twisting or turning the spine to enlarge a perforation. There is no known ethnographic evidence for use of dogfish spines as perforators. However, a spine fragment (Fig. 94c) from an unidentified non-cartilaginous fish was found in the marrow cavity of a perforated coast deer phalanx (H. Savage, personal communication). The fish spine broke, probably either in making the perforation or in removing the contents of the phalanx. Similar naturally sharp dogfish spines would also be readily available tools.

Needles and Shuttles

Ethnographical collections and literature contain virtually no information on Nootkan sewing and weaving hand tools from which attributes and uses could be derived for the classification of such probable tools from the artifact collection. Nootkans have been using steel sewing tools for generations and could not suggest uses for the bone sewing tools.

However, the basic similarity of the bone "needles" with modern sewing, weaving and knitting needles indicates that several principles of use are common to both groups of tools. The size of the eye determines the largest possible thickness of thread that can be sewn with a particular needle. The thinner the needle, the finer the stitching that it can make. Thin or fine needles with the same eye size as wider needles are used for making stitches with the same size of thread, but in material that is tightly woven. Needles with well-sharpened points are usually used for both piercing and stitching, but those with blunt points are often used to pass thread through loosely woven or knitted materials, or through pre-perforated materials. The length of the needle determines the number of stitches and size of weave that can be accommodated. Long needles are used for sewing loosely woven or widely spaced, pre-perforated materials. Short needles are for tightly woven or closely spaced perforated materials. Needles or shuttles used to pass threads through loose materials tend to be flat in cross section so that they can pass easily between fibres without separating them greatly and loosening the weave. Such shuttles also have smooth, blunt points which will not catch on fibres and damage the weave.

According to the above principles, two major classes are apparent among the 55 sewing or weaving artifacts: "needles" and "shuttles." The needles are generally sharp and relatively short. They were likely used essentially for stitching dense material or tightly woven material. A total of 28 needles was identified; 23 were of one shape, "piercing needles," leaving 5 unusual specimens to be described individually. The shuttles are long and flat with dull points. They were probably used for either weaving or sewing very loose or open work material. In contrast to basically one shape of needle, three distinctive shapes of shuttles were recognized: "large," "crude" and "long, slender." These totalled 11 specimens, leaving 2 unusual ones to be discussed individually. Finally, 14 artifacts with missing key attributes could not be identified as either needles or shuttles.

Piercing needles. Twenty-three short, sharp, well-finished needles (Figs. 96, 97; Table 30) were recovered from all four zones.

Table 30. Piercing Needles: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Maximum Width	Maximum Thickness	Minimum Diam. of Perforation
IVd	IT1G5-3579x	41+	3	1.5	1.3
IVa	IT1B7-660x	48	6	2	2.4
IV	IT1F4-1226x	29+	4	2	1.5
IIIc	IT2D12-2299	48	6	2	2.1
IIIc	IT1E10-1484	39+	5	2	1.5
IIIc	IT2E11-1294	50+	6	2	-*
IIa	IT3A20-1094x	44+	4	2	1.3
IIa	IT3A22-1558	45+	5	1.5	-*
IIa	IT3B23B-1126	62+	4+	3	2.0
IIa	IT3C24-1070	34	6	2	2.3
IIa	IT3C24-1074	28+	4	2	1.5
IIa	IT1F18-2186	41+	4	2	1.5
IIa	IT2F18-2346x	42	4	2	1.[illegible]
IIa	IT2F22-2393x	49	4	2	1.5
IIa	IT2G15-2067	44+	4	2	2.4
IIa	IT1H16-2125	46	6	2.5	2.1
IIa	IT1H18A-2162	39+	6	2.5	2.8
IIa	IT2H16-2353	44+	4	2	-*
IIb	IT1J14-2429	38	4	2	1.5
IIb	IT2K13A-2571	42+	5	2	-*
Ib	IT1E25-2360	66+	3	1.5	-*
no provenience	IT1X1-3141	55+	5	2	2.3
	IT1X1-3266	36	5	2	2.0

* Incomplete.

The needles were made from slivers or sections of land mammal bone and bird bone. Cross sections are flat and rectanguloid, or on specimens with remains of the bone cavity, concavo-convex. The widest portion of the needle occurs at the proximal end, usually at the perforation. Proximal ends include rounded and tapered shapes and remains of broken previous perforations. Perforations are biconically bored and round to oval in outline. Straight sides taper from the proximal end to a very sharp point of less than 10°. Dimensions (Table 30) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	34-49	42.6	6.0	8
width	3-6	4.8	1.0	22
thickness	1.5-3.0	2.0	0.3	23
eye diameter	1.3-2.8	1.9	0.5	18

The sharp distal ends and narrow widths would make these needles suitable for piercing thin or very soft materials while sewing them. The relatively short lengths would be suitable for working dense or closely woven materials. Harder materials may have had to be pre-perforated for sewing.

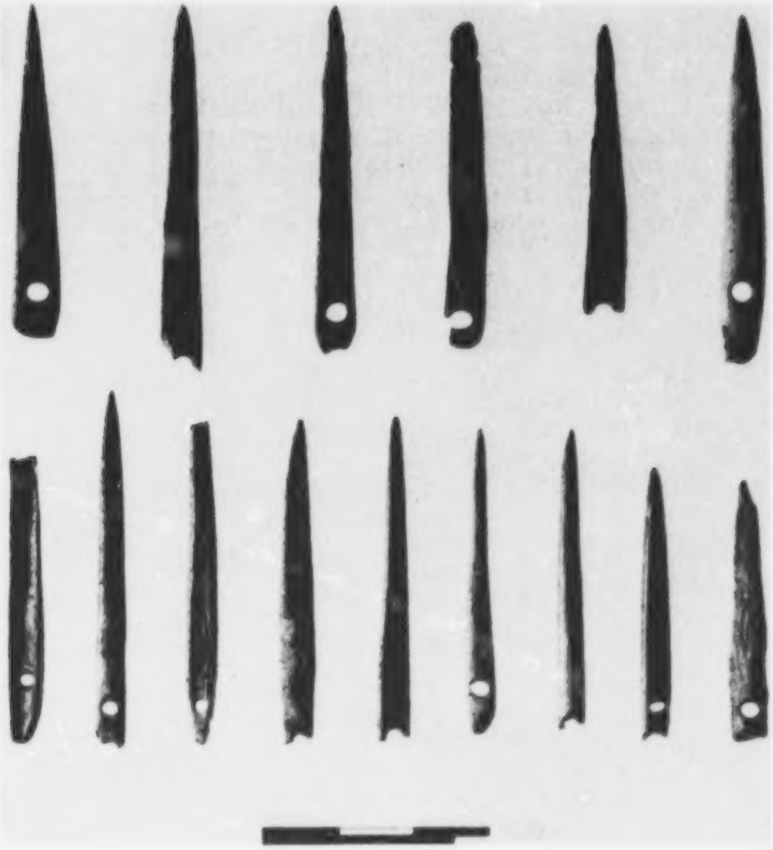


Figure 96. Piercing needles.

Other needles. Five artifacts that do not fit well into the above classes were likely needles. They are described separately below:

The oldest needle in the assemblage (Fig. 97f), recovered from the lower levels of Zone Ib, also has the smallest eye. The eye perforation, 1 mm in diameter, has been made from one side. The fine, even, round perforation, unlike others in the collection, suggests the work of a drill, rather than an awl. Cross section of the needle is round. Maximum diameter, 3 mm, is at the slightly rounded proximal tip, which expands slightly to accommodate the eye. The body of the needle is 2.3 mm in diameter. The needle was originally more than 43 mm long. It is made of land mammal bone.

A proximal fragment of a needle, 1T3B19-5325x, was found in Zone IIa. The proximal tip is ground flat. Sides are straight and parallel. The biconically bored eye is 1.5 mm in diameter.

The longest needle with the smallest eye (Fig. 97k), from Zone IIb, is of land mammal bone. The proximal end is rectangular in cross

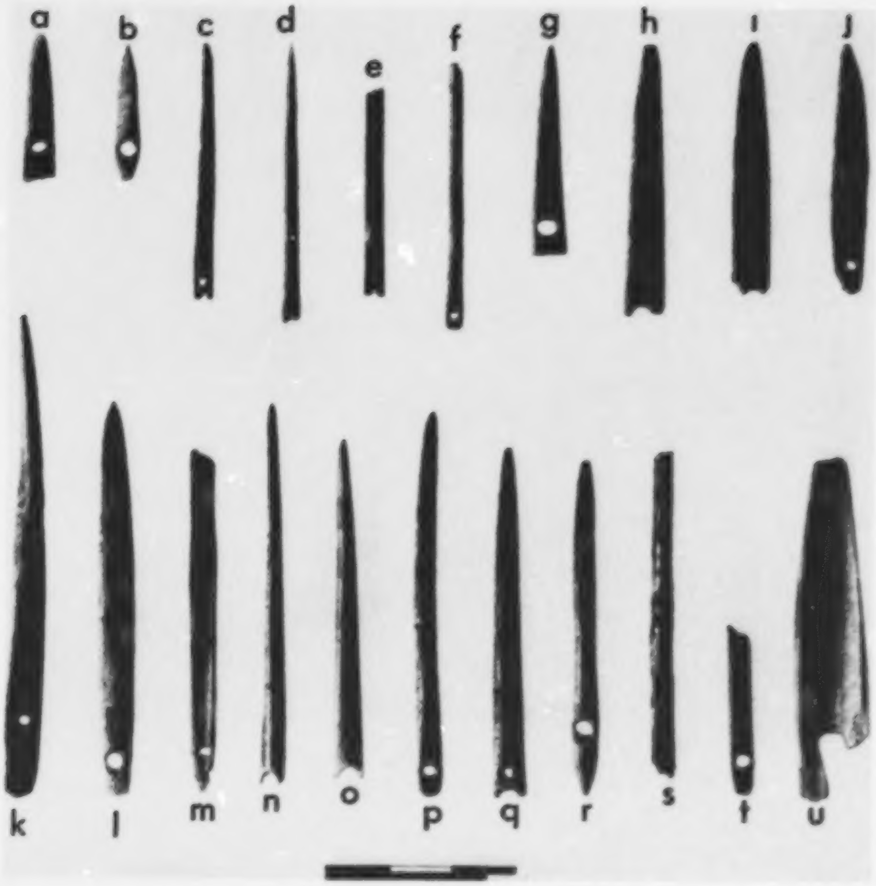


Figure 97. Miscellaneous needles and shuttles. Piercing needles: c, 1T1G5-3579x; d, 1T1E25-2360; g, 1T3C24-1070; n, 1T3B23B-1126; o, 1T1X1-3141. Distally perforated needle: a, 1T2E9-1290x. Other needles: b, 1T1E10-1493; e, 1T2G17A-3733x; f, 1T1E29A-2641x; k, 1T2J14-2189. Other shuttles: i, 1T1C28-2255; u, 1T2A23-2738x. Needles or shuttles: h, 1T2J17-2762x; j, 1T1X1-3013; l, 1T2J17B-2756; m, 1T1X1-3049; p, 1T2A12-785; q, 1T3A24-1580x; r, 1T1J15-2448; s, 1T2B17-926; t, 1T2B24-2850x.

section, except for remains of the marrow channel on one face. The distal end is square in cross section, but twisted in relation to the proximal portion. The distal point is sharp, with sides forming an angle of less than 10°. The biconically bored oval eye has a minimum width of 1.5 mm. The needle is 78 mm long, 6 mm wide and 3 mm thick.

The smallest needle in the assemblage is bird bone (Fig. 97b), recovered from Zone IIIc. Cross section is flat and rectangular. The proximal end is rounded. The biconically bored eye is 2 mm in diameter. Maximum width is at the eye, from which straight sides converge to form a sharp point. The needle is 22 mm long, 4 mm wide and 1.5 mm thick.

An unusual needle fragment of land mammal bone (Fig. 97a) from Zone IIIc is either a broken distal tip that has been perforated for use as a smaller needle, or part of a needle that had its eye in the distal end. The biconically bored eye is 1.5 by 2 mm. The distal tip is blunt and smooth. The artifact is 25 mm long, 5.5 mm wide at the broken end and 2.5 mm thick.

Long, slender shuttles. Three artifacts from Zones IIa,b and IIId are remarkably similar (Fig. 98d-f). Cross section is flat,

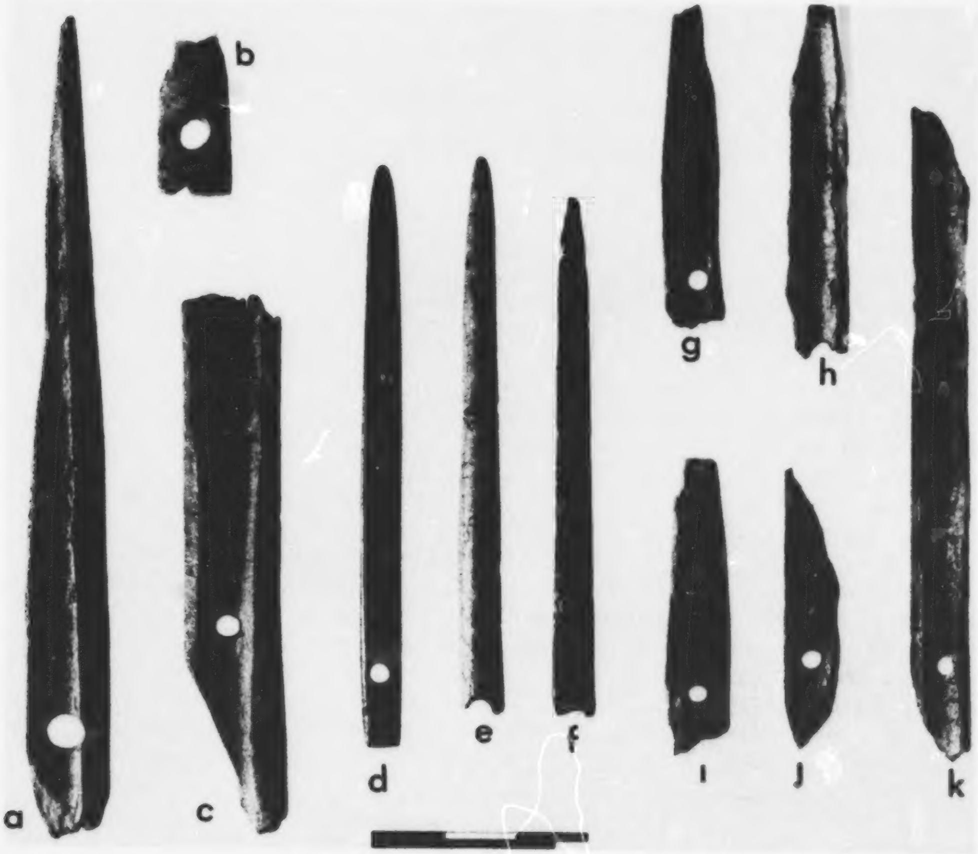


Figure 98. Shuttles. Large shuttles: a, 1T2J17B-2755; b, 1T1J14-3471x; c, 1T1X1-3036. Long, slender shuttles: d, 1T3B25A-1166; e, 1T1J17-2502; f, 1T3B8-2855x. Crude shuttles: g, 1T1X1-3017; h, 1T1A26-1582; i, 1T1X1-3159; j, 1T1H18-2783x; k, 1T2H15B-3578x.

rectanguloid. Sides are straight and nearly parallel, forming a smooth blunt point. The proximal end, intact on only one specimen (Fig. 98d), is ground flat across. Perforations are biconically bored. They are nearly round, with minimum diameters of 2.5 to 3 mm. All three artifacts are 6 mm wide and 2 mm thick. The intact specimen (Fig. 98d) is 81 mm long; the other two were originally approximately that length. The complete specimen is of land mammal bone; the others are bird bone. All three are ground smooth on most surfaces.

These artifacts may have been used as shuttles for passing thread through closely woven, but relatively loose material. The smooth blunt distal ends would not catch fibres. The narrow width and flat thickness would enable the artifacts to be passed through a relatively close weave with little separation of the weave. All three artifacts were originally more than 72 mm long, which could probably accommodate several stitches at once. No artifacts like these were seen in the ethnographical collections studied.

Large shuttles. Three artifacts, judging by their large size, must have been used as large shuttles for very loose or openwork material. Only one artifact is complete, but the others are similar in size and proportion. Two specimens with provenience were found in Zone II.

The complete large shuttle (Fig. 98a), from Zone IIb, is made from split land mammal bone. Most surfaces are ground smooth, except for the proximal end which has been left slightly unfinished. Cross section is roughly rectangular. The widest section, 12 mm across, is through the perforation. The sides are straight and taper to a point of 10°. The perforation, 4.5 mm in diameter, is biconical and nearly round in outline. The artifact is 115 mm long, with a maximum thickness of 4 mm.

A fragmentary artifact (Fig. 98b) from Zone IIa or b may be a proximal portion of a large shuttle like the one described above. Cross section is roughly concavo-convex, due to the shape of the land mammal bone after splitting or sectioning. The widest part of the artifact is the proximal tip, which is ground flat and straight across. The perforation, conically bored from the convex face of the bone, measures 4 by 3.5 mm. The fragment is 10.5 mm wide and 3.5 mm thick.

A fragmentary artifact without provenience (Fig. 98c) is thought to be the proximal end of a large shuttle. It is made from split land mammal bone which has been ground flat on most projecting surfaces, except for the marrow cavity. The proximal end is ground obliquely on one side, with the proximal tip left unfinished. Cross section is roughly concavo-convex, owing to the marrow cavity. The biconical perforation is nearly round in outline, measuring 3 by 2.5 mm. The artifact is 14 mm wide and 6 mm thick.

Crude shuttles. Five artifacts, from Zone II, are called crude shuttles. Compared to other shuttles and needles, these are poorly finished (Fig. 98g-k). They are too rough and too large to serve as needles and could have been used only for passing thread through very loose or openwork material.

The shuttles are made from bird bone which appears to have been split longitudinally. The rough, irregular edges left after splitting are little altered. Proximal ends are unfinished, except for one specimen which has been ground at an oblique angle (Fig. 98j). Some of the pointed distal end remains on three artifacts. One is shaped asymmetrically (Fig. 98g); another is symmetrical, but very blunt (Fig. 98h); and a third has been ground on each side to form a flat, symmetrical point (Fig. 98i). Cross section is concavo-convex, owing to the natural curvature of the split bone. Perforations are biconically bored, except for one specimen (Fig. 98k), whose perforation is bored from the outer cortex of the bone.

Despite their rough appearance, all five artifacts have remarkably similar dimensions (Table 31). Perforation diameters range between 2 and 2.5 mm. Maximum thickness is from 3 to 4 mm; width, from 7 to 10 mm. The only complete shuttle is 41 mm long.

Table 31. Crude Shuttles: Proveniences and Dimensions (mm)

Zone/Stratum	Artifart No.	Length	Maximum Width	Maximum Thickness	Minimum Diam. of Perforation
IIa	1T1A26-1582	49+	9	4	-*
IIa	1T1H18-2783x	-*	7	3	2
IIb	1T2H15B-3578x	90+	8	4	2
no provenience	1T1X1-3017	45+	8	4	2.5
	1T1X1-3159	41	10	3	2

* Incomplete.

Other shuttles. Two shuttles which do not fit well into the above classes are described separately below.

A bird bone artifact from Zone Ib (Fig. 97i) resembles the long slender shuttles in outline and cross section, but is too short to be included with them. The proximal end and most of the eye perforation are broken away. The artifact, 2 mm thick, was originally more than 41 mm long and 6 mm wide.

An artifact from Zone IIa is similar to the crude shuttles, but is well finished (Fig. 97u). It is made from split or sectioned bird bone. The edges are ground smooth. Cross section is concavo-convex owing to the natural curvature of the bird bone. The broken proximal end appears to have been left unfinished. The biconically bored perforation is 3.5 mm across. The distal end of the artifact was originally flat and spatulate-like. The artifact is 56 mm long, 12 mm wide and 3 mm thick. The wide distal end and proportionately large width suggest that the artifact was used as a shuttle for weaving loose material.

Needles or shuttles. Fourteen artifacts could not be classified as either needles or shuttles. They include nine specimens which do not fit comfortably into the above classes. Some of these artifacts had the characteristic shape of needles, but very dull or blunt points that might be found on shuttles. Perhaps these were needles used in conjunction with an awl. Other specimens have a shuttle-like shape, but very sharp points similar to those of the piercing needles. The remaining five specimens, which lack both distal and proximal ends, were recognized as fragments of needles or shuttles from traces of perforations.

A complete reperforated needle or shuttle of land mammal bone (Fig. 97q) was recovered from Zone IIa. Cross section is rectanguloid. Maximum width is at the proximal end from which straight sides converge to a blunt point of about 5°. The biconically borded eye is 1 by 1.5 mm. The artifact is 57 mm long, 5.5 mm wide and 3 mm thick.

A complete land mammal bone artifact (Fig. 97r) from Zone IIa is unusually square in cross section. Sides are straight, terminating in a blunt, worn point. The biconically bored eye is 2.5 mm in diameter. The proximal end terminates in a blunt, worn point, which may have also been used. The artifact is 55 mm long, 4.5 mm wide and 4 mm thick.

Most of the body and proximal portion of a large needle or shuttle, 1T2G15-2075, was recovered from Zone IIa. The proximal tip is more or less rounded, but bears traces of the conical boring of a previous eye. The reperforated eye is biconically bored, 2 mm in diameter. The widest part of the artifact, near the proximal end, is 6 mm wide and 3.5 mm thick. The artifact was originally longer than 39 mm.

A proximal fragment of land mammal bone, from Zone IIa, is nearly square in cross section (Fig. 97t). The proximal end is neatly ground flat. The biconically bored eye is 2 mm in diameter. Maximum width and thickness, 3.5 mm by 3.2 mm, occur at the broken distal portion. The artifact was originally more than 28 mm long.

A complete artifact of land mammal bone (Fig. 97l), from Zone IIb, resembles the long slender shuttles in outline and cross section. The distal tip, however, is extremely sharp, which suggests a piercing function. The proximal tip is ground flat. The biconically bored eye is 2 mm in diameter. The artifact is 65 mm long, 5.5 mm wide and 2 mm thick.

A shuttle-like artifact of land mammal bone (Fig. 97h), from Zone IIb, is broken at both distal and proximal ends. Cross section is rectanguloid. Widest section is at the proximal end from which straight sides converged to a point of 7°. The biconically bored eye was approximately 3 mm across. A new eye was begun, but not completed. The artifact is 2.5 mm thick, and was originally more than 44 mm long and 6.5 mm wide.

A complete, thick needle or shuttle of land mammal bone (Fig. 97p) was recovered from Zone IIIc. Cross section is nearly square, except for the proximal end which is wedge-based to allow for easier perforation. The biconically bored eye is 1 mm in diameter. Sides are straight and parallel, terminating in a blunt, rounded point. The artifact is 63 mm long, 4 mm wide and 4 mm thick.

A complete land mammal bone artifact without provenience may be a crude needle or shuttle (Fig. 97j). Mid-section is rectangular, except for the concave marrow channel on one face. The proximal end is obliquely ground on one face to allow for easier perforation. The biconically bored eye is 1.5 mm in diameter. The distal end is ground obliquely on one side and one face to form a blunt point. The artifact is 41 mm long, 6 mm wide and 3.5 mm thick.

A bird bone artifact without provenience (Fig. 97m) is missing the distal end, or may be uncompleted at the distal end. Cross section is rectangular, but slightly concavo-convex owing to the natural curvature of the bone. The slightly pointed proximal end is left unfinished. The eye, 1.5 mm in diameter, is conically bored from the interior side of the bone. The artifact is 56 mm long, 4.5 mm wide and 2 mm thick.

Five artifacts missing distal and proximal ends were identified as fragments of needles or shuttles from remains of eye perforations. These specimens and their proveniences are as follows:

Provenience	Artifact No.
IVa	1T1C7-2779x
IIIc	1T3A11-3556x
IIIa	1T2B17-926
IIa	1T2F20-3571x
IIa	1T2G17A-3733x

Tools for Working Cedar Bark

Four whalebone artifacts were identified from museum specimens and by respondents as beaters and shredders used to prepare cedar bark strips for weaving and other uses. The remarkable similarity of the archaeological specimens to beaters and shredders collected historically would indicate that the tradition of working cedar bark was well developed at Yuquot by 1000 B.C.

Bark beaters. Two rigid whalebone artifacts from Zones IIIb and IVb are fragments of striking surfaces of bark beaters. The face of each fragment contains several long parallel ridges. The more intact fragment contains six ridges separated by five grooves (Fig. 99d). The ridges near the more intact end are worn down considerably, but in the less-worn surfaces, the grooves are about 2.5 mm deep. The surface of this artifact, when intact, was about 34 mm wide and more than 150 mm long. The other artifact, a corner fragment of the ridged striking surface (Fig. 99c), is too incomplete to merit measurement. The end and long sides of both artifacts are ground flat and at right angles to the grooved surface. They were thus part of a rectangular base.

The artifacts are readily identifiable as fragments of the ridged striking surfaces of bark beaters. Complete beaters are a rectangular block of whalebone with one end continuing into a handle, and with a ridged base as the striking surface (Gunther 1972: fig. 59). Some beaters have a rectangular slot in one side so that the striking body could also be grasped. The beaters, found in most Nootkan ethnographical collections examined, have been described by Koppert (1930: 42-43) and by Drucker (1951: 94).

Bark shredders. Two blade-like whalebone artifacts from the lower levels of Zone IIa are shredders used in preparing cedar bark. One artifact is nearly intact; the other, much less so.

The intact artifact (Fig. 99b) is nearly rectangular in outline with slightly convex ends. Both faces are ground smooth. The upper mid-portion of the body contains a rectangular opening 52 mm long by 20 mm wide. The long side near the opening is ground flat with rounded edges. The opposite side, bevelled on one face to form a sharp edge, is worn down considerably in the middle. The intact end of the artifact is bevelled on each face to form a narrow edge 2.5 mm wide. The artifact, when intact, measured approximately 180 mm long, 87 mm wide and 10 mm thick.

The other artifact (Fig. 99a) misses the upper side and one end. Both faces are ground flat. The nearly intact end has been ground straight and flat, without bevels or any kind of blade. The *remaining* intact side, not noticeably bevelled, is blade-like and worn. The artifact is 19 mm thick. When complete, it was presumably similar to the above described artifact.

All female respondents immediately recognized the nearly intact artifact as a bark shredder. They grasped it through the rectangular opening and imitated the actions of shredding cedar bark. One lady who wove tourist baskets from red cedar bark and grasses actually used the artifact to shred some red cedar bark. She placed a stiff strip of bark across the edge of a table and struck the bark at several sharp angles with the shredder. This softened the strip and made it flexible. Red cedar bark was shredded for numerous uses such as washcloths, napkins,

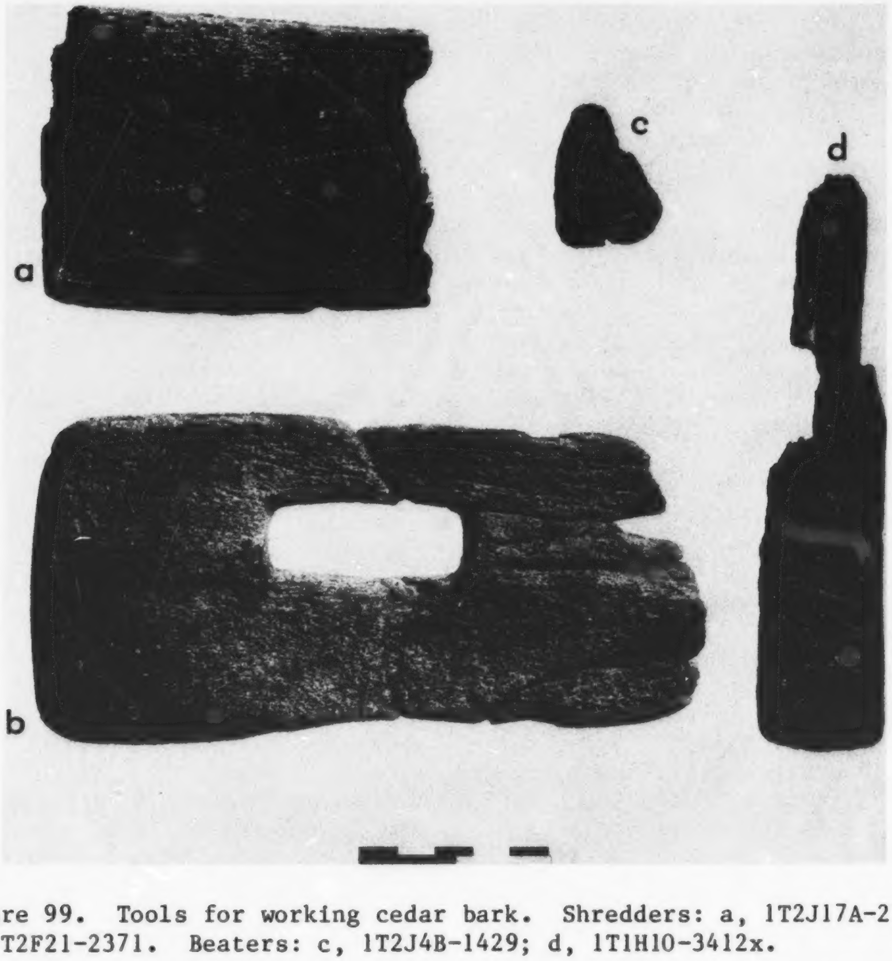


Figure 99. Tools for working cedar bark. Shredders: a, 1T2J17A-2765; b, 1T2F21-2371. Beaters: c, 1T2J4B-1429; d, 1T1H10-3412x.

menstrual napkins, infant headpressers, cradle mattresses and, in the historic period, gun wadding (Drucker 1951: 97).

The ancient shredder is remarkably similar to those collected historically. The shredders in museum collections tend to be slightly larger. Some are bladed only on one long side, as in the case of the presumed incomplete shredder, but others were bladed on three sides, similar to the ancient shredder. Some historic shredders were also decorated with small carved heads at each end near the handle.

Bevelled Bone Rectangles

Ten artifacts are variously bevelled thin bone rectangles (Table 32). All are well finished with most surfaces ground smooth. All with provenience were recovered from Zone II and near the base of Zone III. Several rectangles may have been net gauges, but their use remains to be determined. Three different shapes are apparent among the rectangles.

Table 32. Bevelled Bone Rectangles: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Fig. No.
IIIc	1T2F11A-2304	45	11	4	
IIa	1T1B20-811	57	22	3	102d
IIa	1T2B19-933	54	25	4	102c
IIa	1T2E14A-3332x	80	57	7	102e
IIa	1T2F18-2342	35	26	8	100
IIa	1T1H15A-2113	40	13	4	102a
IIb	1T2H14A-2347	37	15	3	102b
no provenience	1T1X1-3000	36	15	4	101
	1T1X1-3001	52	17	6	102f

Two rectangles, one of sea mammal bone (Fig. 100) and the other of land mammal bone (Fig. 101), are bifacially ground to form an edge down

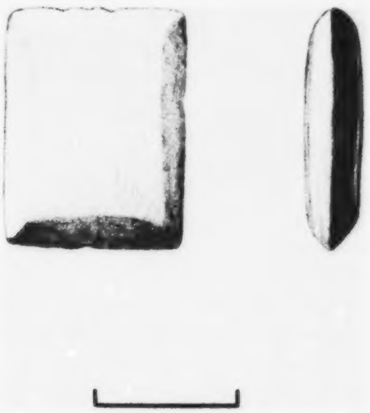


Figure 100. Bevelled bone rectangle of sea mammal bone from Zone IIa (1T2F18-2342). (Scale: 0-2 cm.)

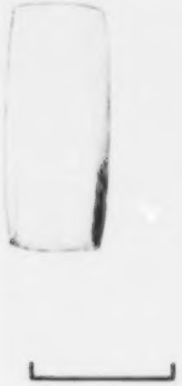


Figure 101. Bevelled bone rectangle of land mammal bone (1T1X1-3000). (Scale: 0-2 cm.)

the middle of both sides and ends. Cross section is lenticular. There is no apparent wear on the sides and ends.

Six rectangles are ground flat across straight ends and sides (Fig. 102; Table 32). The long sides are bifacially ground along the edge where the face and side meet, so that three facets are present on the long sides. The middle facet is from 1 to 2 mm wide. The faces are ground smooth. Some wear polish appears to be present on the long sides, but this is not well defined on the small pieces. Included with this group is a very waterworn rectangle (Fig. 102f) whose sides appear to have been originally bevelled. There is also a portion of rib without side bevels (Fig. 102b), but with naturally rounded edges which have similar shape to the bevelled sides. The largest rectangle (Fig. 102) is smooth and polished from wear on the complete long side; perhaps this artifact was a creaser in basketry or mat making.

An additional rectangle of split land mammal bone, 1T2F11A-2304, may be an uncompleted example of the above shape. Projecting surfaces on both faces are ground down. Sides and ends are ground flat, but not bevelled. This artifact was recovered from near the base of Zone III.

The above described two shapes of bone rectangles generally resemble net gauges known historically in coastal cultures. However, the historic Nootkans did not use net gauges or shuttles (Drucker 1951: 25). Such devices may have been used in prehistoric times, but became discontinued.

The suggestion of a creaser for the large rectangle and possibly others with the flat edges may be explored when more rectangles are uncovered in future excavations.

A fragmentary burned whalebone artifact (Fig. 103) from near the base of Zone II has some affinity with the other two rectangle shapes. Assuming that the artifact was originally bilaterally symmetrical, it would have had straight ends and incurvate sides. The sides are bifacially ground on the corners to leave a wide middle bevel down each side. The intact portion of the end is ground to a blunt straight edge without noticeable bevels. The surfaces within 5 mm of the edge are smooth and shiny from wear. Striae are not visible, perhaps because the artifact is burnt. Heavy abrasive striae cover the faces and sides. The artifact is 37 mm wide and 7 mm thick at the broken midsection. The use of this artifact is not known.

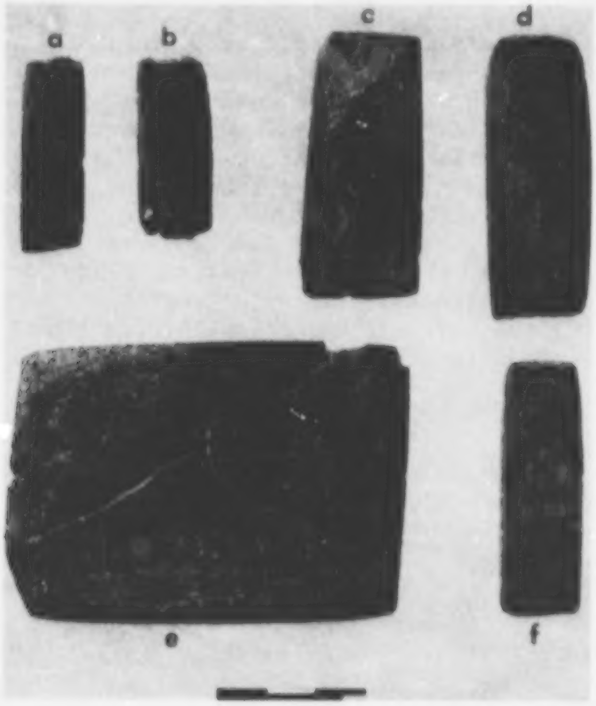


Figure 102. Bevelled bone rectangles: a, 1T1H15A-2113 from Zone IIa; b, 1T2H14A-2347 from Zone IIb; c, 1T2B19-933 from Zone IIa; d, 1T1B20-811 from Zone IIa; e, 1T2E14A-3332x from base of Zone III; f, 1T1X1-3001. (Scale: cm, in.)

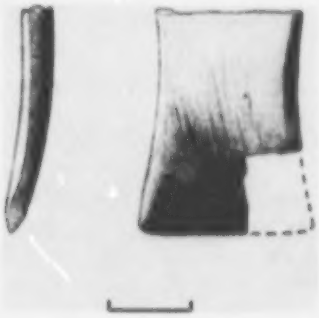


Figure 103. Fragmentary whalebone artifact from near the base of Zone IIa (1T2F22-2376x). (Scale: 0-2 cm.)

Knives

Apart from the various awls which likely had knife-like uses such as splitting, only three artifacts might properly be called knives in that they appear sharp enough to cut. They are made of stone, shell and bird bone.

Stone knife. A fragmentary ground stone blade (Fig. 104) of aphanitic to fine-grained basaltic tuff (Muller 1979) was recovered from the base of Zone IIIc. The artifact is wedge-shaped in cross section; its faces form an angle of 20°. The back of the artifact, 13 mm thick, is either broken or uncompleted. The flat faces converge sharply to form a straight blade originally longer than 42 mm. One blade face has a fine bevel 2.5 mm wide. The other face is unbevelled. Sharpening striae on both blade faces have obliterated any wear patterns that might have formed. The sides of the artifact near the blade have broken away; those near the back are either broken or uncompleted. Although the artifact is thick at the back, it resembles the ulu-like fish knives used by the Coast Salish (cf. Barnett 1955: 62, fig. 11) and likely had a similar use.

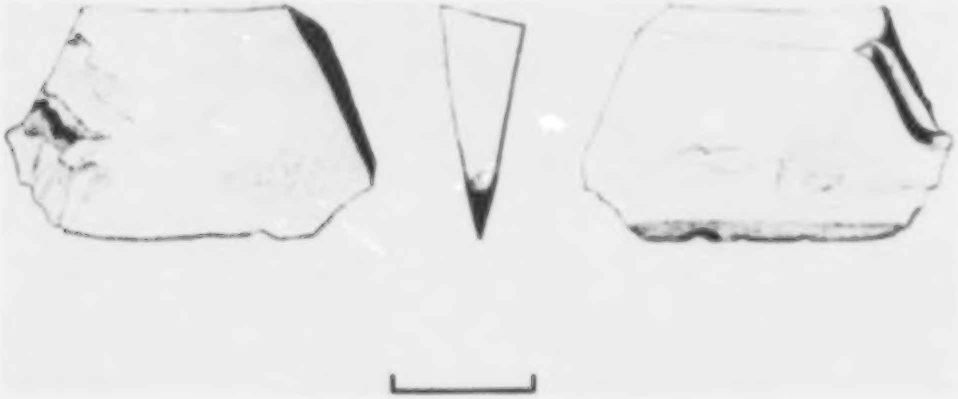


Figure 104. Knife of basaltic tuff from the base of Zone IIIc (1T2F13A-2318). (Scale: 0-2 cm.)

Shell knife. A fragment of what may be a shell knife of Mytilus californianus (Fig. 105c) was found in the lower levels of Zone IIIc. The valve has been ground slightly flat on both faces, but still retains some concavity. One edge of the valve is ground into a curved blade with a single bevel 3 to 5 mm wide on the interior face. A portion of a worked side remains. It was ground flat and straight. The other side and "back" of the artifact are missing. The artifact is 3 mm thick. The blade was originally more than 37 mm long. The ground edge suggests a fragment of mussel valve ground sharp on the lip edge for cutting salmon (see Drucker 1951: 91).

Bird bone knife. A bird bone element from Zone IVb appears to have been worked into a knife (Fig. 105a). It has a broad, thin pointed tip with sides forming an angle of about 15°. The tip and sides are ground bifacially to a sharp edge about 20 mm long on both sides. The tip is 2 mm thick. The proximal end of the artifact appears to have broken away. The artifact was originally more than 78 mm long. The sharpened sides suggest use as a knife.

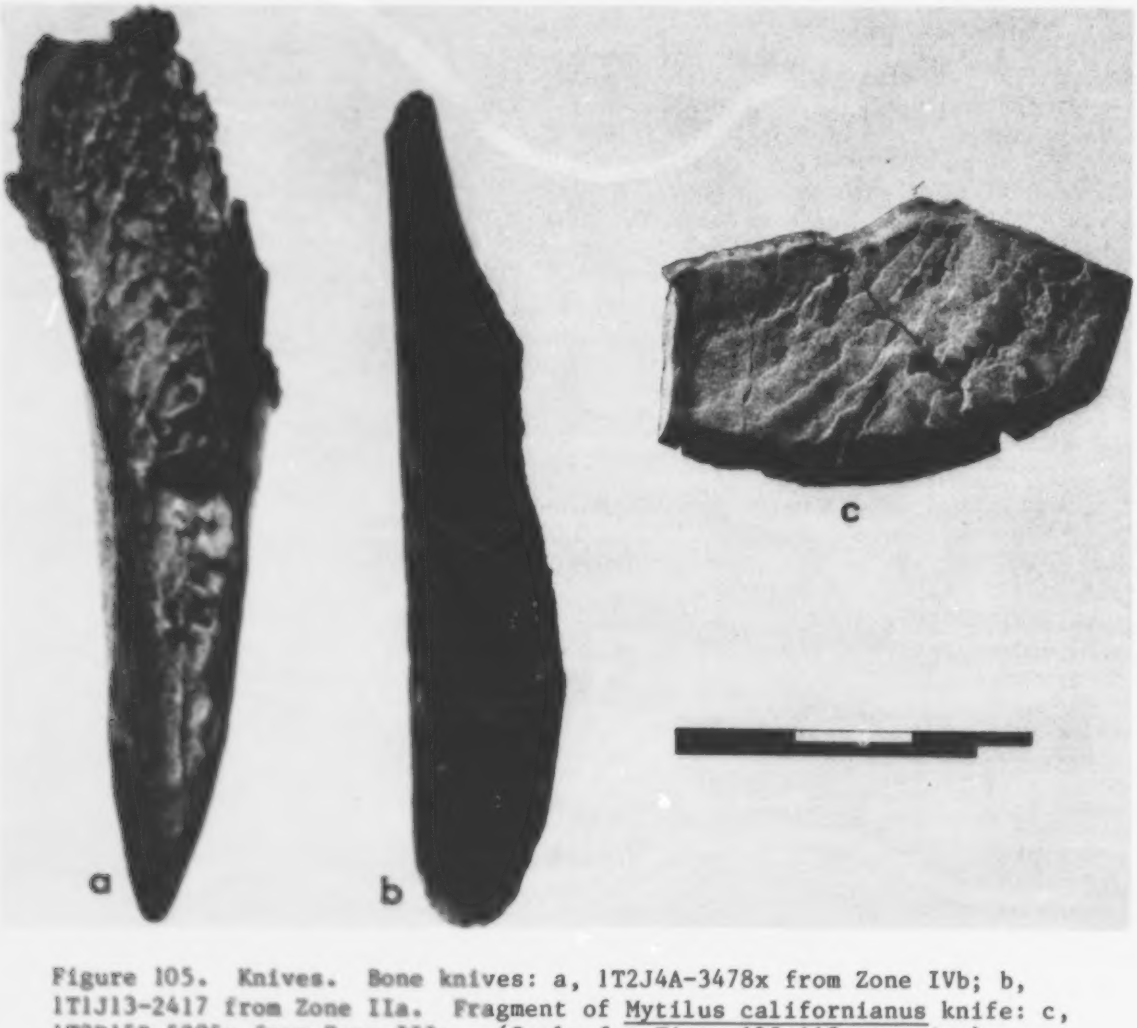


Figure 105. Knives. Bone knives: a, 1T2J4A-3478x from Zone IVb; b, 1T1J13-2417 from Zone IIa. Fragment of Mytilus californianus knife: c, 1T2D15B-5295x from Zone IIIc. (Scale for Figs. 105-115: cm, in.)

Fishing with Hooks and Lines

The food procurement practice represented by the largest number of artifacts in the archaeological record is fishing with hooks and lines. At least 533 artifacts have likely come from devices used in this practice. Zonal distribution is as follows: Zone I, 3; Zone II, 109; Zone III, 141; Zone IV, 243; without provenience, 37. In addition, 27 stones with piddock burrows may have been used as sinkers. These totals, however, are probably very conservative with reasons discussed in the various classes of artifacts below. Fishing with hooks and lines involves virtually all composite devices whose bone and stone parts remain in the midden. These are represented by essentially three groups of classes.

The largest group is arming points of composite fish-hooks. Comparison of these points with those on ethnographical specimens suggests the presence of U-shaped bentwood hooks and varieties of sharp-angled hooks. Only a few classes of arming points are diagnostic of the types of hooks.

Related to the arming points are the shanks of composite fish-hooks. Bone and stone shanks, mostly of trolling hooks, were recovered archaeologically. The under representation of shanks compared to arming points is probably due to use of wood for most shanks, as is known for the historic period.

The third class group is gorges, of which 11 styles are described. Some imply specific uses and temporal ranges.

A fourth class group or broad class is possible fishing sinkers of stones with portions of piddock burrows.

Arming Points of Composite Fish-Hooks

The largest use category of Yuquot artifacts, after abrader fragments, is arming points of composite fish-hooks. At least 418 artifacts likely served this purpose. More are undoubtedly present in the assemblage as distal tips or body fragments that could not be reasonably identified and had to be assigned to unclassifiable fragments. The grouping of miscellaneous points probably also contains several fish-hook arming points that did not fit comfortably into the classification.

Basically, seven classes of points have been distinguished. (Ten classes are listed, but two include unfinished or fragmentary specimens of other classes, while the points with flared ends are atypical.) Most of the seven basic classes have been identified regarding general use by means of ethnographical sources and collections. The thin wedge-based points are probably peculiar to small jigs or snags. The unilaterally single-barbed points armed sharp-angled, straight-shanked hooks used for cod and salmon trolling. No ethnographic specimens with sharp-angled points could be found, but they may have armed gigs or snags. The various spindle-shaped points and bird bone points are known from ethnographical collections to have armed bentwood halibut or cod hooks, and various sharp-angled hooks. The latter include specialized trolling hooks and the ubiquitous straight-shanked hook used for salmon and cod.

Thin wedge-based points. Twenty-three thin wedge-based points of land mammal bone and bird bone (Fig. 106; Table 33) probably armed composite fish-hooks. The points were found in Zones IIa, III and IV.

The points are relatively uniform in shape. All are long, slender and very sharp. Maximum width and thickness are usually in the midportion and separate the point into distal and proximal portions. Sides of the distal tip form an angle ranging from 5 to 15°. Cross sections of the distal portions vary from almost round to rectangular. The proximal one-third to two-thirds of the point is wedge-shaped, with both faces ground flat. Cross section is rectangular. Most proximal bases are straight, and less than 1 mm thick.

Table 33. Thin Wedge-Based Points: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Base Width	Angle of Point (°)
IVd	1T1G5-1800x	33	4	3	3	15
IVb	1T1J38-1675	30	3	3	3	15
IIId	1T2A10-2729x	45+	5	5	pointed	10
IIIc	1T1A12-440x	26	3	3	3	15
IIIc	1T1B14-764	27	4	4	2	10
IIIc	1T1C11-388x	62	5	3	3	10
IIIc	1T1D15B-2590	50	4	3	3	5
IIIc	1T1D17B-2595	45	4	4	6	10
IIIc	1T2D14B-2364	55+	5	3	3	5
IIIc	1T2D15B-2603	37	3	3	2	5
IIIc	1T1F8-1266	39	4	2	-	10
IIIc	1T1F13A-2067	37	4	2	4	10
IIIb	1T1J7-1783	37	4	4	4	10
IIIa	1T2C18-5410x	29+	3	2	3	10
IIIa	1T1F12A-2035	33	4	3	2	10
IIa	1T2B20-3734x	33	4	2	3	10
IIa	1T1C20A-1086	27	3	2	3	10
IIa	1T2F14A-2320	32	3	3	4	10
IIa	1T1N6-1976	33	3	2	3	10
IIa	1T1J17-2488	61	6	3	pointed	5
no provenience	1T1X1-3065	36	5	4	3	5
	1T1X1-3160	42	4	3	3	10
	1T1X1-3293	30	2	2	3	5

The thin wedge-based points vary considerably in size, but do not appear to form clusters of sizes. Dimensions (Table 33) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	24-62	38.4	11.10	20
width	2-6	3.9	0.92	23
thickness	2-5	3.0	0.82	23
base width	1-5	3.0	0.95	22

Respondents could not identify any of the points. No point was found in context with any other.

The thin wedge-based points strongly resemble the wedge-based arming points of composite harpoon heads discussed later in this report. The thin wedge-based points are more sharply pointed, with sides of the distal point forming smaller angles. Maximum width in relation to length is also less on the thin wedge-based points.

The thin wedge-based points probably armed small double-pointed fish-hooks. Remarkably similar points were found on several complete tripartite fish-hooks at Ozette (illustrated in Gleeson n.d.b: plate 1; Friedman 1976: fig. 9). They consist of a straight wooden shank with an expanded base split for insertion of two thin wedge-based points on opposite sides. The points are secured with wild cherry bark lashings, and project from the shank at approximately a 25° angle. The small complete double-pointed hooks (WSU Cat. No. 45CA24B70/145/IV/57) have a wooden shank approximately 40 mm long; its points, both remarkably similar in size, are 25 mm long, 2.5 mm wide and 1.5 mm thick. A large double-pointed hook (WSU Cat. No. 45CA24B70/145/IV/137) has a shank about 95 mm long; only one of its wedge-based points could be measured: 55 mm long, 5.5 mm wide and 4 mm thick. The dimensions of the Ozette points fall within those of the Yuquot thin wedge-based points (cf. Table 33).

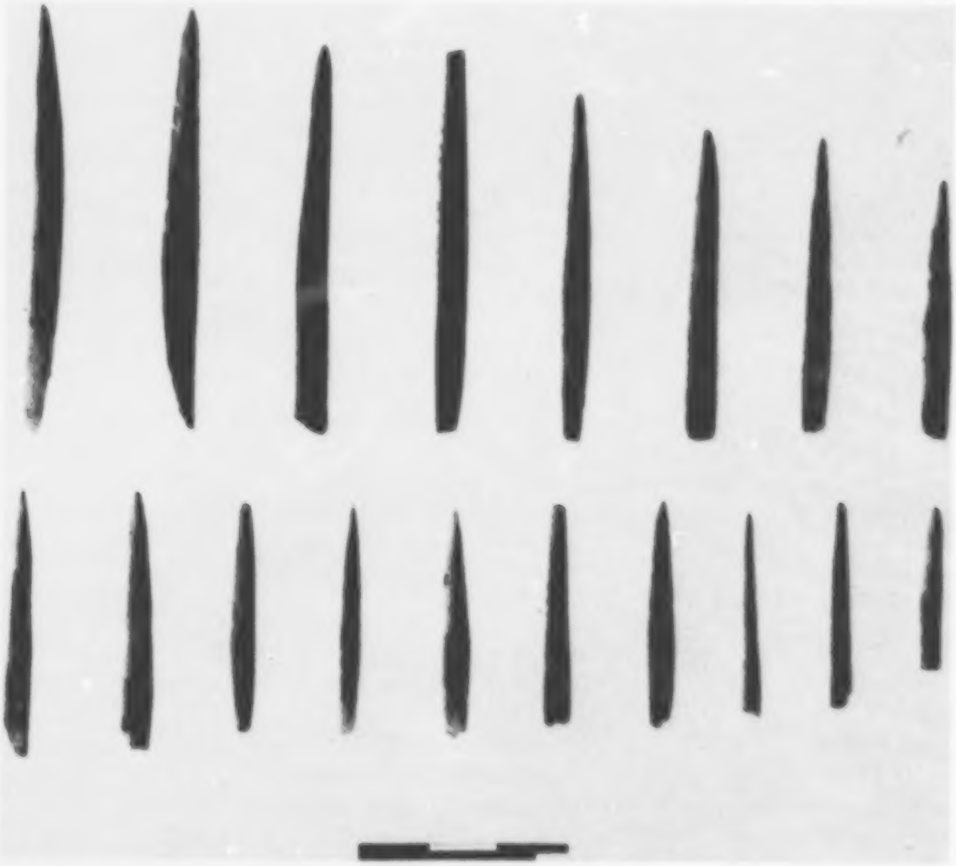


Figure 106. Thin wedge-based points.

A double-pointed fish-hook like the Ozette ones was collected by Hewitt, possibly at Nootka Sound, in 1792 (British Museum, Hewitt Collection, Vancouver 139; illustrated in British Museum 1925: 270, fig. 256, no. 2). Such hooks were used as "a sort of gig or snag for hooking fish where they are plentiful" (Niblack 1970: 290, Plate XXX - fig. 146).

Spindle-shaped points. One hundred forty-five spindle-shaped points of land mammal bone (Figs. 107, 108; Table 34) were recovered from Zones I, II, III and IV. Most of the points probably armed composite fish-hooks.

Although the artifacts vary considerably in shape, they have key attributes in common. The distal end is a carefully sharpened point with sides forming an angle of less than 10°. Cross section varies from round to rectanguloid. The body of the artifact expands in a spindle-shape in midsection or in the proximal half. Maximum width and

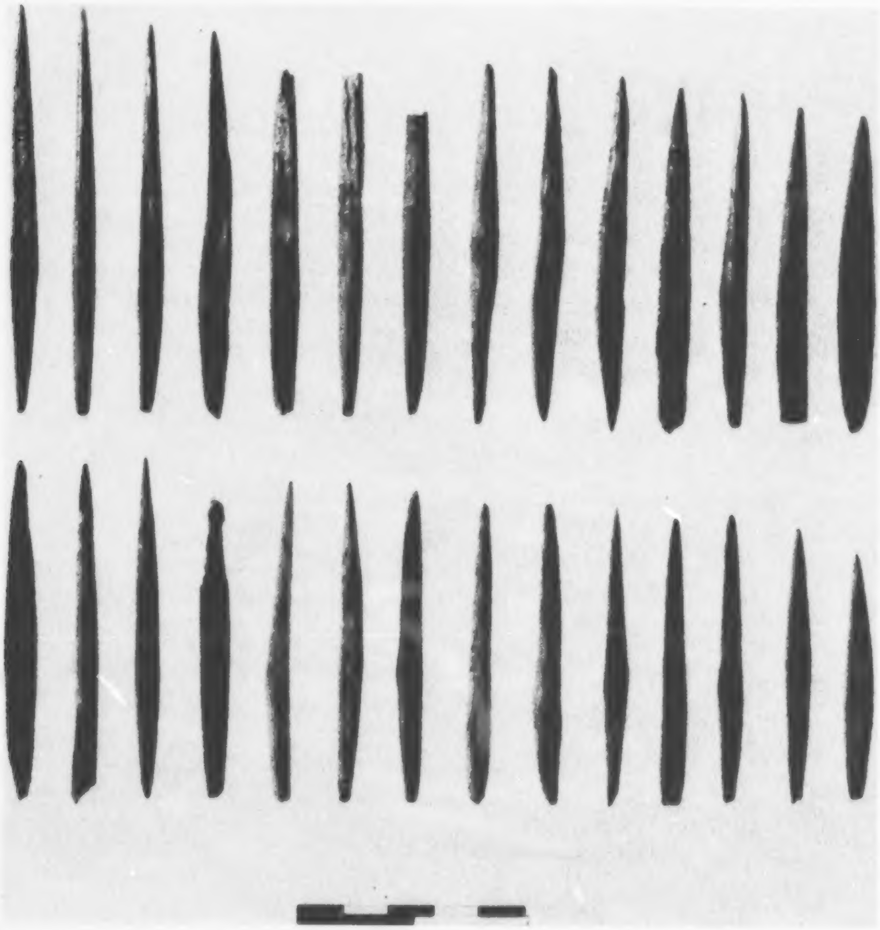


Figure 107. Spindle-shaped points.

thickness are reached in this expansion. On the points round or oval in cross section, expansion in the spindle-shape tends to be relatively uniform on all sides. Points rectanguloid in cross section, however, expand on the lateral edges, so that they may appear more biconvex than technically spindle-shaped. (The attribute of spindle-shape becomes expressed more as biconvexity as the artifact becomes more flat.) The proximal end often tapers to a blunt point. This often gives the artifacts the appearance of bipointed gorge hooks, but the proximal end is not sharpened for piercing. Proximal ends may have various tapered shapes: round, asymmetrically angular and flat. Prehistoric points often exhibit many facets from shaping with abraders, whereas historic period points tend to show whittle facets, presumably produced by iron tools. The spindle portions of many specimens are discoloured by reddish-brown stains which were likely produced by plant fibre lashings, just as cherry bark lashings have stained bone and wood parts of ethnographical composite artifacts.

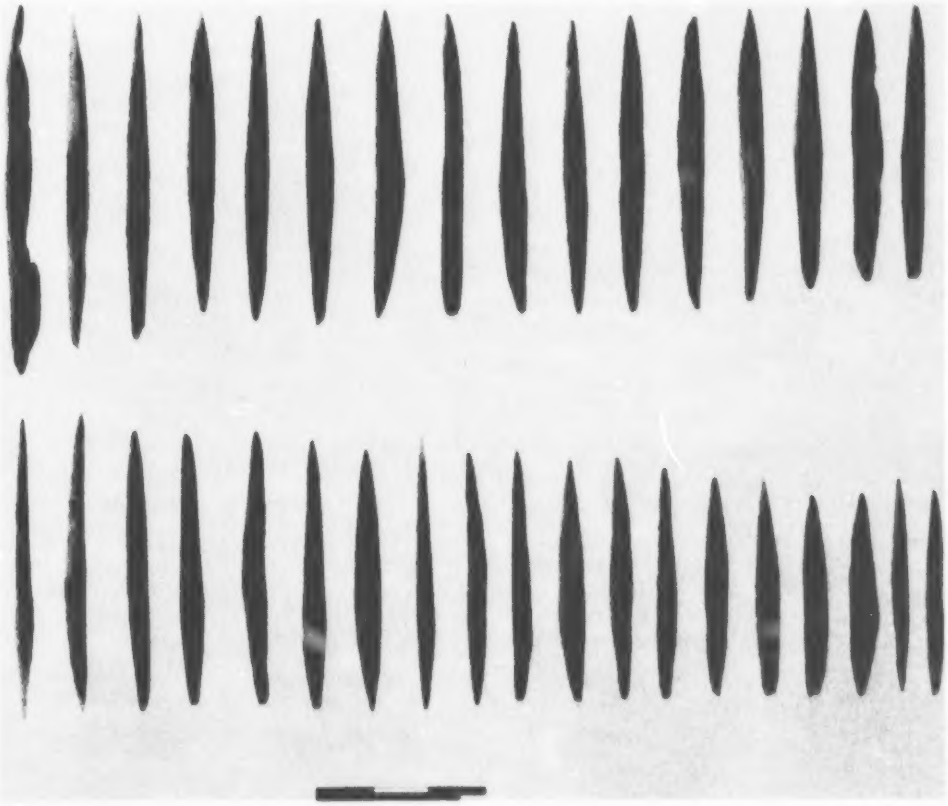


Figure 108. Spindle-shaped points.

Table 34. Spindle-Shaped Points: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVe	IT2J1-1363	50	4	4
IVe	IT2M1-1603	44	3	3
IVd	IT1A1-6x	48	3	3
IVd	IT2A2-548x	43+	4	3
IVd	IT1B1-508	46	5	4
IVd	IT1B2B-539	72	6	4
IVd	IT1B2B-524x	39+	5	4
IVd	IT2B1-76x	58	4	4
IVd	IT2B1A-3558x	44+	4	4
IVd	IT2B2B-114x	45	4	3
IVd	IT3B1B-461x	47	5	4
IVd	IT3B1B-483x	65	6	4
IVd	IT3B2B-472	53	5	3
IVd	IT1C1-53	60	4	3
IVd	IT1C2-125	65	6	4
IVd	IT2C2-484x	47+	5	4
IVd	IT3C2A-150	43	5	4
IVd	IT1D2-3564x	35+	4	3
IVd	IT1D3A-1958x	39	4	3
IVd	IT1D2-1943	39	4	4
IVd	IT1D5-2005	52	4	4
IVd	IT2D1-2179	43	5	4
IVd	IT2D2A-2178	80	6	6
IVd	IT1E1-1356x	47+	4	4
IVd	IT1E2-1365x	32	3	2
IVd	IT1E2-1366	44	4	4
IVd	IT2E1-906	50+	4	4
IVd	IT2E1-908	78	7	4
IVd	IT2E2-997	46+	5	4
IVd	IT2E2-1024	63	5	4
IVd	IT2E2-1043	50+	4	4
IVd	IT2E3-1253	49	7	3
IVd	IT1F3-1047	41+	3	3
IVd	IT1F4-1219	49	4	3
IVd	IT2F2-1687x	65	5	4
IVd	IT2F3A-1720	50	5	5
IVd	IT2F4-1741	45	4	4
IVd	IT2F4-1742	60	7	4
IVd	IT2F5A-1773	53	4	4
IVd	IT1G5-1782x	41	4	4
IVd	IT2G2-1374x	46+	3	3
IVd	IT2G2-1377x	72	5	4
IVd	IT2G4-1311	36+	5	4
IVd	IT2G4-1317	29	3	2
IVd	IT1H4-1322	37+	5	4
IVd	IT2H1-1661	53+	5	4
IVc	IT1F5A-1241	51	7	4
IVc	IT1F7-1251	38	4	3
IVc	IT1G7B-1841	50	6	5
IVc	IT1G7B-1852	60	7	5
IVc	IT1G8B-1592	80	6	4
IVc	IT2G6B-1344	67	6	4
IVc	IT2G7B-1437x	74+	6	4
IVc	IT2G8A-1500	68+	7	4
IVc	IT2G8A-1505x	32	4	3
IVc	IT1H7B-1441	60	7	5
IVc	IT2H5B-1827	75	7	6
IVb	IT2E4-1238	68+	7	4
IVb	IT1F5B-1236	36	5	3
IVb	IT2F6A-1793	52	5	4
IVb	IT1G5-1798x	53	4	3
IVb	IT1G7A-1859	77+	6	5
IVb	IT2G5-1330x	55	5	3
IVb	IT2G6B-1388	53+	6	3
IVb	IT2G7A-1425x	54	6	3
IVb	IT1H3-1376	47	4	3
IVb	IT1H5-1333	68	6	5
IVb	IT1H5-1339	58+	6	4
IVb	IT1H5-1341	71	8	5
IVb	IT1H6-1407x	57+	7	4
IVb	IT1H7A-1438x	66+	6	5
IVb	IT1H7B-1489x	44	4	3
IVb	IT2H3-1771	67+	6	4
IVb	IT2H3A-1778	49+	7	4
IVb	IT2H4-1804	58+	5	4

(Cont'd)

Table 34. (Cont'd)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVb	1T2H4-1807	36	3	2
IVb	1T2H5A-1828	54	5	4
IVb	1T2H5A-1832	56+	7	4
IVb	1T1J2-1627	48	6	5
IVb	1T1J2-1630	93	5	4
IVb	1T1J2-1633	47	3	3
IVb	1T1J2-3452x	66	6	4
IVb	1T1J3A-1654	62	6	4
IVb	1T1J4B-1688	50	5	4
IVb	1T2J2-1323	46+	6	4
IVb	1T2J3A-1334	66	7	4
IVb	1T2J3A-1386x	38	3	3
IVb	1T2J4-5286x	72	7	4
IVb	1T1K2A-1398	73	6	3
IVb	1T1K2A-1402	92	7	4
IVb	1T1K2A-1403	88	6	3
IVb	1T1K2A-1404	77	6	5
IVb	1T1K2A-1415	47	4	4
IVb	1T1K4A-1475	68	6	4
IVb	1T1K4B-1463x	55	5	4
IVb	1T2K5A-1702	70	6	4
IVb	1T1L2A-1664	52+	6	4
IVb	1T1L5A-1789	32	4	3
IVb	1T2L3B-1917	77	6	5
IVb	1T2L3B-1934	62	6	5
IVb	1T1M3-1907	38	5	4
IVb	1T1M5-1932x	44+	4	4
IVa	1T2A2-3744x	53	4	3
IVa	1T3A5-669	78+	7	5
IVa	1T1B2A-518	47+	6	4
IVa	1T1B2A-519	62+	6	5
IVa	1T2B3B-139	85	5	3
IVa	1T1C1-96	54	4	4
IVa	1T1C4A-181x	42	4	4
IVa	1T1C7-277x	36	4	3
IVa	1T2D4B-2183	76	8	6
IVa	1T2D4B-2205	55	5	4
IIId	1T1A9B-383	71	7	4
IIId	1T3C10-412x	48	5	3
IIIc	1T1A12-427	63	7	6
IIIc	1T3A14B-873x	53	5	5
IIIc	1T1B12-727	59	5	4
IIIc	1T2D15B-2396	43	5	3
IIIc	1T2C11-2905x	38	5	3
IIIc	1T1G10A-1894	48	4	4
IIIc	1T1F6A-1248	39	6	4
IIIc	1T2F10-1869	48	5	3
IIIb	1T1G9A-1880	39	4	3
IIIb	1T2G9A-1521	38	4	4
IIIb	1T2G5B-1496	79	6	5
IIIa	1T2B17A-919	42	6	3
IIa	1T2A17-830x	25+	3	3
IIa	1T2A21-1148	55	7	3
IIa	1T3C19A-877	58+	6	5
IIa	1T1E16-2270	86	7	4
IIa	1T2F14A-2222	36	5	4
IIa	1T1G19B-2409	54	5	5
IIa	1T1J15-2454	45	3	2
Ib	1T1C32-2694	68+	7	4
Ib	1T2F27B-2460	49+	4	4
no provenience	1T1A-2666x	61	7	4
	1T2B-534x	52+	5	4
	1T2H-1886x	43	4	4
	1T1K-1550	52	5	3
	1T1X1-3007	68	5	3
	1T1X1-3023	52	5	4
	1T1X1-3054	38	5	4
	1T1X1-3232	41	5	4
	1T1X1-3247	53	4	3
	1T1X1-3277	41	4	3

Size varies considerably. Dimensions (Table 34) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	29-93	54.79	14.63	108
width	3-8	5.17	1.22	145
thickness	2-6	3.84	0.79	145

Although the sample does not show size clusters, the wide range in size must reflect some specialization, which is suggested by ethnographical artifacts.

The spindle-shaped points are commonly found on composite fish-hooks in ethnographical collections. The spindle shape facilitated lashing the point to the shank and prevented the point from slipping out of its lashings, according to the lashing pattern employed by the Nootkans. This is readily apparent when one attempts to pull a point from its lashings. The expanding spindle shape immediately encounters increasingly tighter lashings.

Spindle-shaped points longer than 80 mm are found on composite U-shaped halibut hooks (Table 35). This length is attained by some of the Yuquot points from Zone IV (Table 34). It is interesting to see that spindle-shaped points from the prehistoric zones are generally much shorter. The longer points are perhaps a refinement developed with the commercial halibut fishery in the late 19th century.

Table 35. Dimensions (mm) of Bone Arming Points on Composite U-Shaped Halibut Hooks

Museum	Cat. No.	Length	Width	Thickness
AMNH	16/1704	81	7	5
	16/1705	83	5*	5*
	16/1710	95	5.5	5
	16/1735	82	7	5
	16/18361	107	6	5
	16.1/2352	96	6.5	6
MAI	3/4723	99	8	4
	3/4723	92	7	5.5
	3/4723	91	6	5.5
	3/4723	99.5	7	4
	23/1213	94	6	5
NMM	VII-F-13	107	7	7
	VII-F-105	106	6	5.5
	VII-F-293	97	6	4
	VII-F-510	113	8	7
PM	250	106	6	6
	250	117	8	5.5
	250	84	6	5
PMS	E 3549	86	6	4.5
	E 15227	113	7	6.5
	E 23716	85	6	4
	E 28533	89	6	5.5
	E 28534	92	6.5	4.5

* Approximate measurement owing to lashings.

Spindle-shaped points also armed small U-shaped composite hooks:

Museum/Catalogue No.	Length (mm)	Width (mm)	Thickness (mm)
PM/250	54	3.5	3.5
PMS/E 3634	34	2.0	1.5
WSU (Ozette) 45CA24B70/210/VII/20	37.5	?	2.0

Dimensions of the shorter Yuquot spindle-shaped points (Table 34) compare favourably with the above specimens.

The spindle-shaped points also are found on various sharp-angled, straight-shanked composite hooks used for cod and trolling for salmon (cf. Force and Force 1968: 162; Gunther 1972: fig. 49).

Unilaterally single-barbed points. Forty-three well-finished unilaterally single-barbed points (Figs. 109, 110; Table 36) were

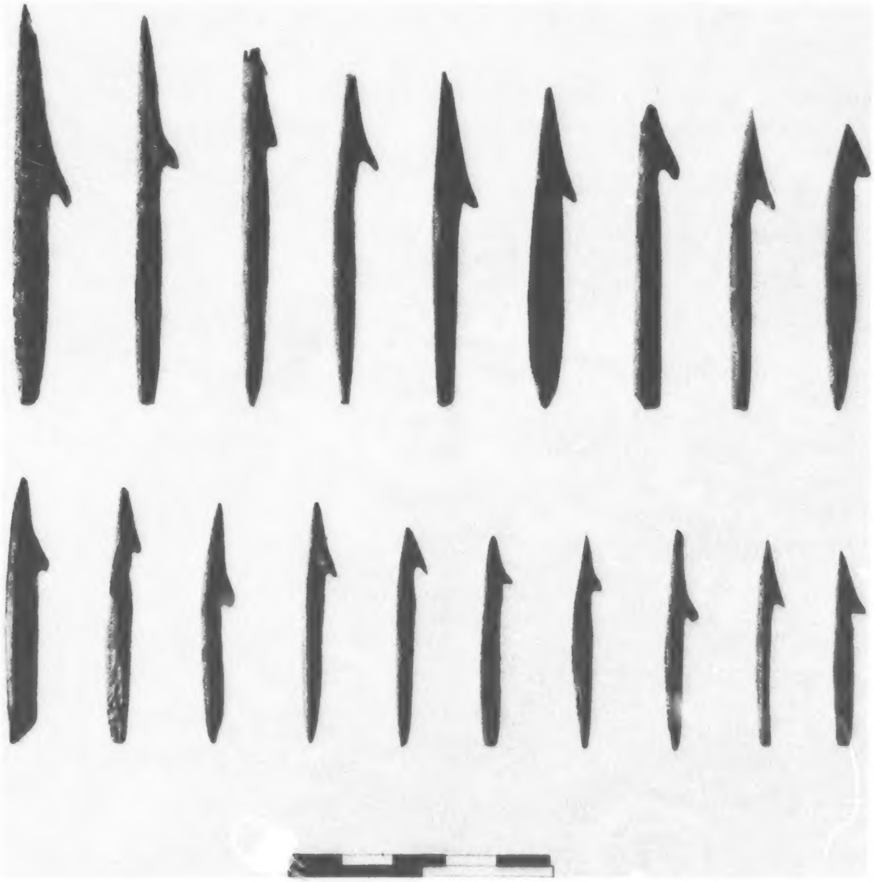


Figure 109. Unilaterally single-barbed points.

recovered from Zones II, III and IV. The points armed sharp-angled composite fish-hooks.

The points are uniform in shape. The distal end is a sharp single-barbed tip. Its sides form angles ranging from 10 to 40°, averaging between 15 and 20° (n=40). One side of the tip extends into a single barb, well isolated from the body. The barb shape, therefore, was obviously functional rather than decorative. The barbs were formed by sawing at a sharp angle into the side of the point; thus, the faces near the base of the barb often bear short, shallow saw grooves. Most barbs are wedge-shaped with sharp tips. Some barbs are truncated with blunt tips. At least two barbs are cone-like and sharp. The body of the points is spindle-shaped; sides are slightly biconvex or parallel in outline. The midsection of most points is rectanguloid; several are nearly round; six are rectangular. The shape of the proximal ends varies considerably. Most taper symmetrically to blunt pointed or rounded tips. Six ends are ground flat. Only one proximal end is markedly asymmetrical. Most points are made of land mammal bone or antler. One specimen is of sea mammal bone and one is of split bird bone. Most surfaces are ground smooth.

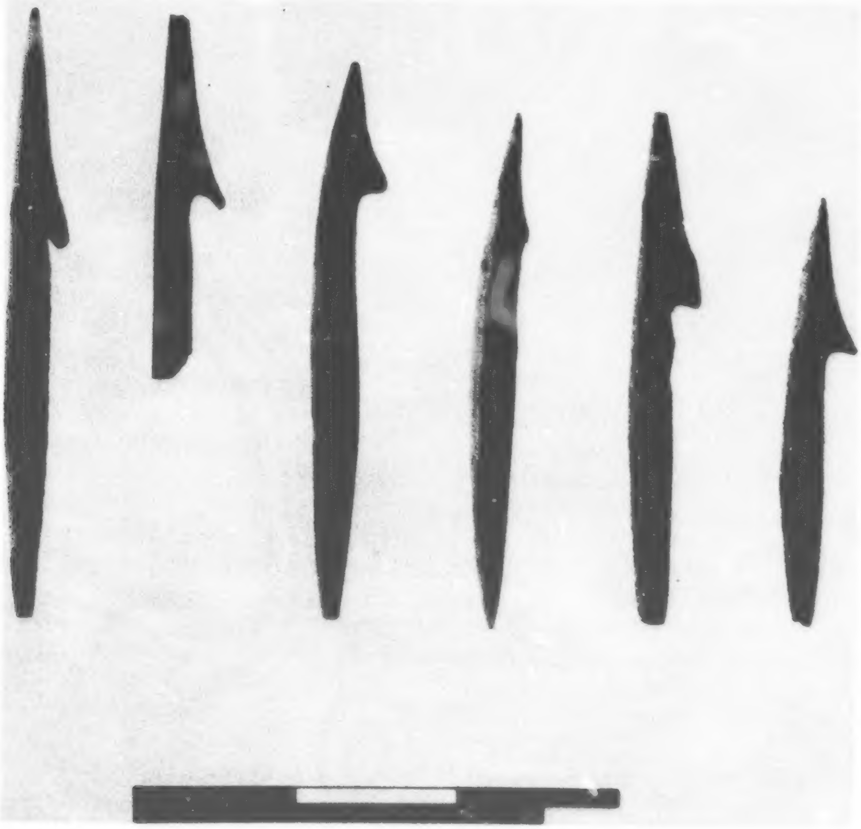


Figure 110. Small unilaterally single-barbed points.

Table 36. Unilaterally Single-Barbed Points: Proveniences and Measurements (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Angle of Point (°)
IVa	1T1B6-643	tip	-*	-*	15
IVa	1T1D5-2010x	50	6	6	20
IVa	1T1E5-1326	34	3	3	15
IIId	1T1A10-402	63	5	5	10
IIId	1T3A8-255x	37	4	2	20
IIId	1T3A9-274x	26+	3	3	15
IIId	1T3A9-282	32	3	2	15
IIId	1T3B6-569x	45	4	4	15
IIIc	1T1A15B-860	57+	5	4	20
IIIc	1T2A11-700x	53	5	4	20
IIIc	1T2A12-748x	tip	-*	-*	15
IIIc	1T2A14A-801	63+	5	5	15
IIIc	1T3A11-325x	43+	5	4	20
IIIc	1T3B11-743	41	4	3	15
IIIc	1T1C11-390x	39+	3	3	20
IIIc	1T1C17-2880x	58	5	3	25
IIIc	1T2C11-2897x	37	3	3	10
IIIc	1T2D14B-2391x	-*	3	3	10
IIIc	1T1E9-1456	frag.	-*	-*	-*
IIIc	1T1E13-2306	32	3	3	15
IIIc	1T2F14A-2327	tip	-*	-*	30
IIIc	1T2G9-1518	42	4	3	15
IIIb	1T2H8-1885	44+	5	5	-*
IIa	1T2A18-834	76	7	6	10
IIa	1T2A21-1155	61	7	4	15
IIa	1T3A21-1600	54	6	5	40
IIa	1T3A24-1569	45	4	4	20
IIa	1T3A27A-1586	49+	5	3	15
IIa	1T1B26-1172	41	3	2	15
IIa	1T2B22-1068	49	4	4	15
IIa	1T3B18-814	49	5	4	15
IIa	1T2D23-2624	40	4	4	25
IIa	1T2E14A-2003	59+	5	4	15
IIa	1T1H11-2020	42	4	3	30
IIa	1T1H13-2040	58+	7	4	20
IIa	1T1H15A-2109	40	4	3	20
IIa	1T2J10-2090	56+	7	4	-*
IIa	1T2J10-2100	58+	5	5	20
no provenience	1T3C-2652x	74	5	5	10
	1T1E-1347x	51	6	5	15
	1T1X1-3069	38	4	3	25
	1T1X1-3138	43	5	5	20
	1T1X1-3220	67	6	4	15

* No data.

Size varies considerably. Dimensions (Table 36) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	32-76	47.92	12.06	27
width	3-7	4.64	1.22	39
thickness	2-6	3.82	1.02	39

Within this wide range of dimensions, there must have been some specialization of sizes, but the artifacts display a continuous curve without apparent size clusters.

The unilaterally single-barbed points armed sharp-angled composite fish-hooks. The spindle-shaped bodies and proximal tip shapes of the barbed points are attributes of unbarbed points lashed to the U-shaped shanks of halibut and cod hooks. The barbed points are nearly identical to one arming a composite wooden shanked fish-hook (cf. British Museum 1925: 250, Fig. 256, no. 7) collected from the Northwest Coast by Hewitt in 1792 (British Museum, Hewitt Collection, Vancouver 141). Exact provenance of this fish-hook is not known, but it could well be Nootka Sound. The wooden shank is remarkably similar to a curved stemmed bone shank (Fig. 119) from Zone II. The barbed points may have been fixed to bone shanks as well. Ellis, who visited Nootka Sound with Cook, writes "their fish-hooks are made of bone with a very sharp and barbed point; their usual bait are muscles [sic]." (Ellis 1783). Barbed points were used to arm straight wooden shanks:

> For the hook, they usually make use of a straight piece of hardwood, in the lower part of which is inserted, and well secured with thread or whale sinew, a bit of bone made very sharp at the point and bearded (Jewitt 1974: 61).

Straight-shanked, sharp-angled hooks used for cod and for trolling for salmon were armed with "a barbed splinter of hardwood or bone" (Drucker 1951: 22). It is interesting that the barbed fish-hook points appear to discontinue after the early historic period. Possibly they were replaced by barbed metal fish-hooks; Jewitt claims that the Nootkans preferred his iron hooks to their wood and bone ones (Jewitt 1974: 61). Barbed composite fishhooks are not present in 19th century ethnological collections. Respondents could not identify the unilaterally single-barbed points, even from folk memory.

Fragments of spindle-shaped points and single-barbed points. Ninety-seven artifacts of land mammal bone (Fig. 111; Table 37) from Zones II, III and IV are proximal fragments of spindle-shaped points and unilaterally single-barbed points. Both have the same proximal shape, so they cannot be differentiated from the proximal fragments.

Table 37. Fragments of Spindle-Shaped Points and Single-Barbed Points: Proveniences

Zone/Stratum	IIa	IIb	IIIa	IIIb	IIIc	IIId	IVa
Artifact No.:	1T1A25-1578x 1T2B24-3796x 1T1F17-2156 1T2F14A-2321 1T2G16-2097 1T2H14A-3436x 1T2J11-2105x 1T1N7A-871x	1T2H18A-2411x	1T1B18-3803x	1T2J5A-1461 1T2K6-1747 1T2K7-1808x 1T1L6B-1853x 1T1L8A-2549 1T2L8-2120 1T1M6-1942	1T2A15A-812 1T2A15-5456x 1T3B10-658 1T1E6-2967x 1T1E7-1394 1T1E7-1411 1T2G9-3400x	1T2C8-5409x 1T3C8-393x	1T3A5-152 1T2B5-3545x 1T3B3A-493x 1T1D6-2012 1T2D3B-3567x 1T2D6-2227 1T2E3-1205 1T2C5-558x

	IVb			IVc	IVd	IVe	no provenience
Artifact No.:	1T1F7-1262 1T1G7A-1845x 1T2G6B-1401 1T1H4-1314x 1T1H4-1325 1T1H5-5376x 1T1H5-5378x 1T1H5-5380x 1T1H5-5381x 1T1H6A-3768x 1T2H4-3824x 1T2H5A-1834 1T2H6-1846x 1T2H6A-1849 1T1J2-1632	1T1J2-1635x 1T1J3A-1656x 1T1J3B-1676x 1T1J3B-1677x 1T1J4B-1692 1T2J2-1301x 1T2J3A-1332 1T1K3-1420x 1T2K3-1659 1T2K3-1662x 1T2K3A-5458x 1T2K4A-1669 1T2K4A-1678 1T2K4B-1680	1T2K5A-1701 1T1L1A-3419x 1T1L4A-1710 1T1L4A-1719 1T1L3A-1668 1T2L3B-1920 1T2L3B-1931x	1T1G7B-1849 1T1G7B-1850 1T1G8B-1599 1T1G8B-1868 1T2G5-1329 1T2G6-3572x 1T2G7-3801x	1T2A-530x 1T1B2B-522 1T1C2-2901x 1T2C1-438 1T1D5-2008 1T2D1-2175 1T2D2A-2180x 1T2E1-958 1T2F3A-1695 1T2F3A-1740x 1T1G2-1700 1T1G3-1735x 1T1G4-1752x 1T1G5-1799x 1T2G2-1372x	1T2J1-1370 1T1L1C-1616 1T1M1-1882x	1T1X1-3136 1T1X1-3272

The fragments are round or rectanguloid in cross section. One end has broken from the body of the original artifact. The intact end tapers to a bluntly pointed, but sometimes rounded or flattened tip. Several specimens have a transverse notch near the tip. Many grinding or whittling facets are present.

All these attributes are found on the proximal portions of spindle-shaped points and unilaterally single-barbed points. The sizes of the proximal ends of these points and the fragmentary artifacts are also similar.

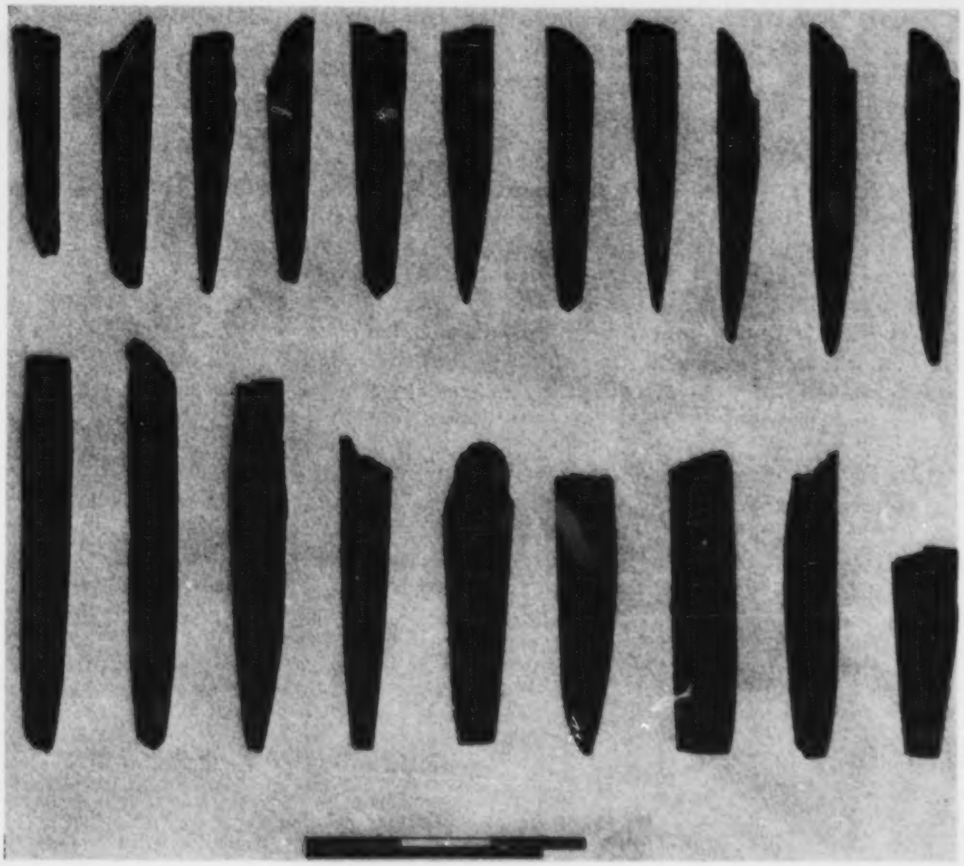


Figure 111. Proximal fragments of spindle-shaped points and unilaterally single-barbed points.

Biconvex flat points of bird bone. Nineteen points (Fig. 112; Table 38) from Zones II, III and IV appear to be bird bone versions of the unbarbed spindle-shaped points. The spindle-shape attribute becomes expressed as biconvexity in the flat medium of split or sectioned bird bone.

Although the points are made somewhat irregularly, all have key attributes in common. The points are slightly biconvex in outline, with maximum width at the middle or near the proximal end. The proximal ends taper to a blunt or rounded point; ventral and dorsal faces are often tapered at the proximal end as well. The distal ends are ground to sharp tapering points with sides forming angles of 5 - 15°. Cross section is rectangular, but slightly concavo-convex owing to the natural curvature of the bird bone. The lateral edges on some points remain unmodified after splitting and sectioning. Incisions from sectioning are apparent on a few specimens.

The points range considerably in size, but do not appear to form clusters, although functional specialization was likely present.

Table 38. Biconvex Flat Bird Bone Points: Proveniences and Measurements (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Angle of Point (°)
IVe	1T2M1-1602x	35	3	2	5
IVd	1T2E3-1229x	30	3	2	10
IVb	1T2M2-1615	62	5	3	5
IVb	1T2K3B-1647	63	4	2	5
IVa	1T2E5-1255	41	4	3	10
IIId	1T3A7-238x	48	5	2	10
IIIc	1T1C9-366	52	5	2	5
IIIc	1T2D8-2237	43	4	2	10
IIIb	1T2G10-1526x	42	4	2	10
IIa	1T3C24-1076	69	3	2	5
IIa	1T1G18-2368	95	4	2	10
IIa	1T1G21-2490	42	5	3	10
IIa	1T1H14A-2087x	32	4	2	15
IIa	1T1J13-3467x	37	4	2	5
IIa	1T1J15-2452	47	3	2	5
IIa	1T1J20B-2604	56	6	2	15
IIa	1T1K15A-2210x	71	8	2	5
IIb	1T1H15B-1992	30	5	2	10
IIb	1T1J17-2474	50	6	2	10

Dimensions (Table 38) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	30-95	49.73	16.61	19
width	3-8	4.47	1.26	19
thickness	2-3	2.16	0.37	19

The biconvexity (here, flattened spindle-shape), blunt pointed proximal ends and sharp pointed distal ends are all attributes of points used to arm composite fish-hooks. Two complete small U-shaped composite hooks are armed with biconvex bird bone points similar to those from Yuquot:

PMS Cat. No.	Length(mm)	Width (mm)	Thickness (mm)
E 15228	39	3	1.5
E 37882	26	2	1.5

The thinness of the biconvex bird bone points would probably make them prone to fracture. They were likely used with various small fish-hook shanks.

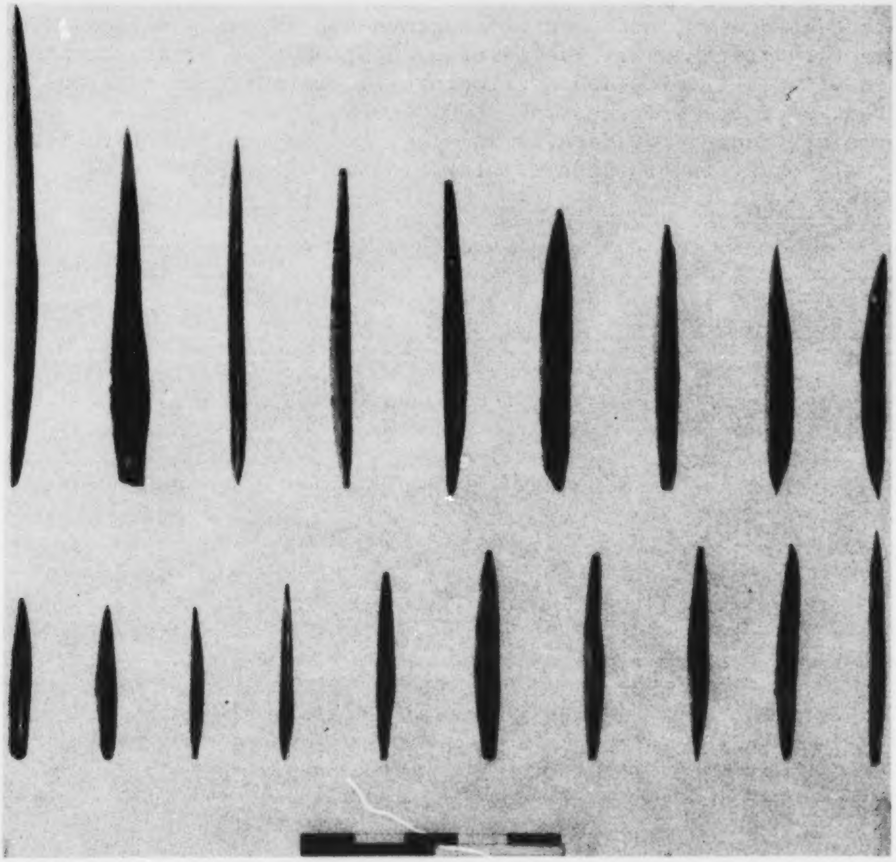


Figure 112. Biconvex flat points of bird bone.

Small bird bone points with finished ends. Twenty-eight small flat bird bone points with finished proximal ends (Fig. 113) were recovered from Zones II, III and IV (Table 39).

relatively uniform in shape. The distal ends are ground symmetrically to a sharp point with straight sides forming an angle of 10° or less. Cross section is rectangular, or slightly concavo-convex with the natural curvature of the bird bone. The proximal end, usually the widest part of the artifact, is ground flat: either neatly squared off in relation to the sides, or at a slight angle to the sides. The proximal ends of three artifacts were sawed partway through and snapped off along the saw groove to leave a relatively flat end.

Table 39. Small Bird Bone Points with Finished Ends: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVa	1T2A6-3745x	33	6	2
IVa	1T1B7-662	31	4	3
IIId	1T1A7-3769x	28	5	2
IIId	1T1B8-675	30	4	2
IIIc	1T1D17C-2953x	22	4	2
IIa	1T1A22-1554	30	3	2
IIa	1T1A23-1561x	30	4	2
IIa	1T2A20-1151x	35	4	2
IIa	1T1B24-1106	32	5	3
IIa	1T2B21-1061x	23	4	2
IIa	1T2B23-1072x	32	5	2
IIa	1T3B18-806x	29	4	3
IIa	1T2C23-1178	47	6	2
IIa	1T2D21-2686	42	4	2
IIa	1T2H14A-2345x	32	4	2
IIa	1T2H18-2418x	33	4	2
IIa	1T1J15-2445	30	5	2
IIa	1T1J21B-2620x	38	4	2
IIa	1T2L14-2193	29	4	2
IIa	1T2N4C-1985x	44	3	2
IIb	1T2H13B-2339x	32	5	3
IIb	1T1J11-2378x	28	4	2
IIb	1T2J12B-3749x	25	5	2
IIb	1T1K15A-2208	41	4	3
no provenience	1T1X1-3149	35	5	2
	1T1X1-3150	28	4	2
	1T1X1-3038	35	5	2
	1T1X1-3255	37	4	2

The points do not form apparent size clusters. Dimensions (Table 39) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	22-47	32.54	5.91	28
width	3-6	4.36	0.73	28
thickness	2-3	2.19	0.39	28

The points probably armed shanks of various small composite fish-hooks. The points are so similar to the small bird bone points with unfinished ends discussed in the next section that the ethnographical examples given there would also apply to these points. Particularly pertinent is the bird bone point with a snapped off flat end that is part of a composite fish-hook (NMM Cat. No. VII-F-292b).

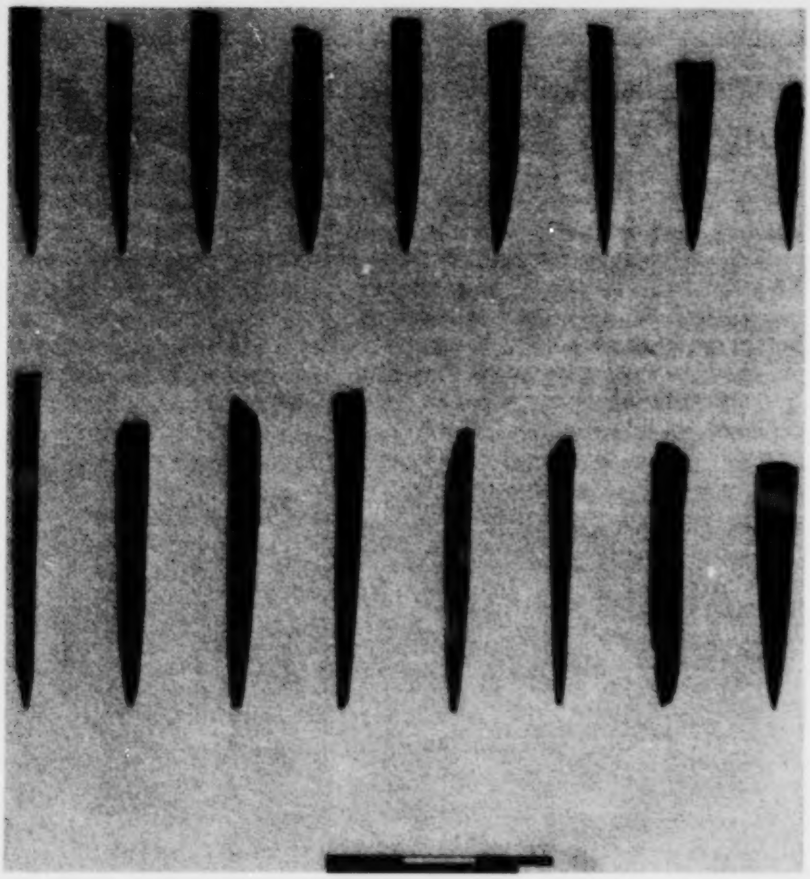


Figure 113. Small bird bone points with finished proximal ends.

Small bird bone points with unfinished ends. Thirty-six bird bone points (Fig. 114; Table 40) from all four zones have rough, unfinished proximal ends.

Because the rough proximal ends can indicate either a broken artifact or a complete artifact with an unfinished end, it is not possible to determine whether the points are, in fact, complete artifacts. Any of the points may represent one of three possibilities. The points may have been deliberately snapped off a larger section of bone during shaping and used with unfinished ends. Ethnographic artifacts indicate that this was a common practice. The points are perhaps not complete, but rather the discarded broken sections of once larger artifacts. The points could also be re-used tips broken off once larger artifacts. One should not assume that all the small bird bone points with unfinished ends necessarily had the same use(s) inferred from similarity of shape.

The artifacts are similar to the bird bone points with finished ends, but less uniform because of unfinished edges. Distal points are relatively symmetrically pointed, with the point sides forming angles of 10° or less. Cross sections are rectangular or slightly concavo-convex from the natural curvature of the split bird bone. Most lateral edges are ground smooth, but some specimens have unfinished ones left from splitting or sectioning. Maximum width is frequently at or near the proximal end. The proximal ends vary considerably, from very uneven, irregular tips to relatively straight, even tips.

Table 40. Small Bird Bone Points with Unfinished Ends: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVb	1T2F7A-1820x	35	4	2
IVb	1T1H6B-1427	44	4	2
IVb	1T1J4-1685x	26	4	2
IVc	1T1G7B-1843x	37	3	2
IVc	1T2G6-3573x	37	4	2
IVa	1T1B6-640	31	4	2
IIId	1T3A6-214x	29	4	1
IIId	1T1B9-677	33	5	2
IIIc	1T3B11-757x	29	4	2
IIIc	1T2D8-2241x	30	4	2
IIIc	1T1E9-1430	55	5	2
IIIc	1T1E9-1432	44	4	2
IIIc	1T1E10-1462	42	5	2
IIIc	1T2G8C-1499	40	3	2
IIIb	1T2G10-1532x	27	3	2
IIIb	1T2K6-1738	28	4	2
IIa	1T1A24-2725x	31	5	2
IIa	1T2A23-1180x	31	3	2
IIa	1T3B23B-1129	40	4	2
IIa	1T3B25A-2864x	44	4	2
IIa	1T1C20A-2884x	45	5	2
IIa	1T1C23-1099x	28	3	2
IIa	1T2D21-2960x	61	6	4
IIa	1T1H13-2061x	35	4	2
IIa	1T1H17-3419x	32	4	1
IIa	1T1H20-2757	27	3	1
IIa	1T2H17-2359x	40	4	2
IIa	1T2H18B-2416x	35	3	2
IIa	1T1J18A-2514x	45	4	2
IIa	1T1K9-1900	30+	4	2
IIa	1T2N4B-5248x	42	5	2
IIb	1T2J16A-5247x	32	5	2
IIb	1T2L13-2184x	47	5	2
IIb	1T2L14-3741x	53	5	2
Ib	1T2B30-2623	26+	4	2
Ib	1T1J21-2616	32	4	1

Despite the different possible origins of these points, dimensions (Table 40) are remarkably consistent:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	26-61	37.26	8.66	34
width	3-6	4.11	0.75	36
thickness	1-4	1.94	0.47	36

Although the possibilities of manufacture discussed above must be taken into account, all of the points could have armed shanks of various composite fish-hooks. Two composite hooks collected before 1897 from the Seshaht (NMM Cat. Nos. VII-F-292a-b), are armed with points identical in shape to, but slightly smaller than the artifacts described above. Both points are bird bone ground sharp at one end and snapped off at the other, leaving a rough, but more or less flat end. One of these points could pass for a small bird bone point with finished end. The points are lashed with sinew into the split end of a straight wooden shank, which has a nettle fibre line attached at the opposite end. Dimensions of the fishhook parts are as follows:

Catalogue No.	Point Dimensions (mm)	Shank Dimensions (mm)
VII-F-292a	20 x 2 x 1.5	48.5 x 3 x 2.5
VII-F-292b	18.5 x 2.5 x 1	44.5 x 3 x 3

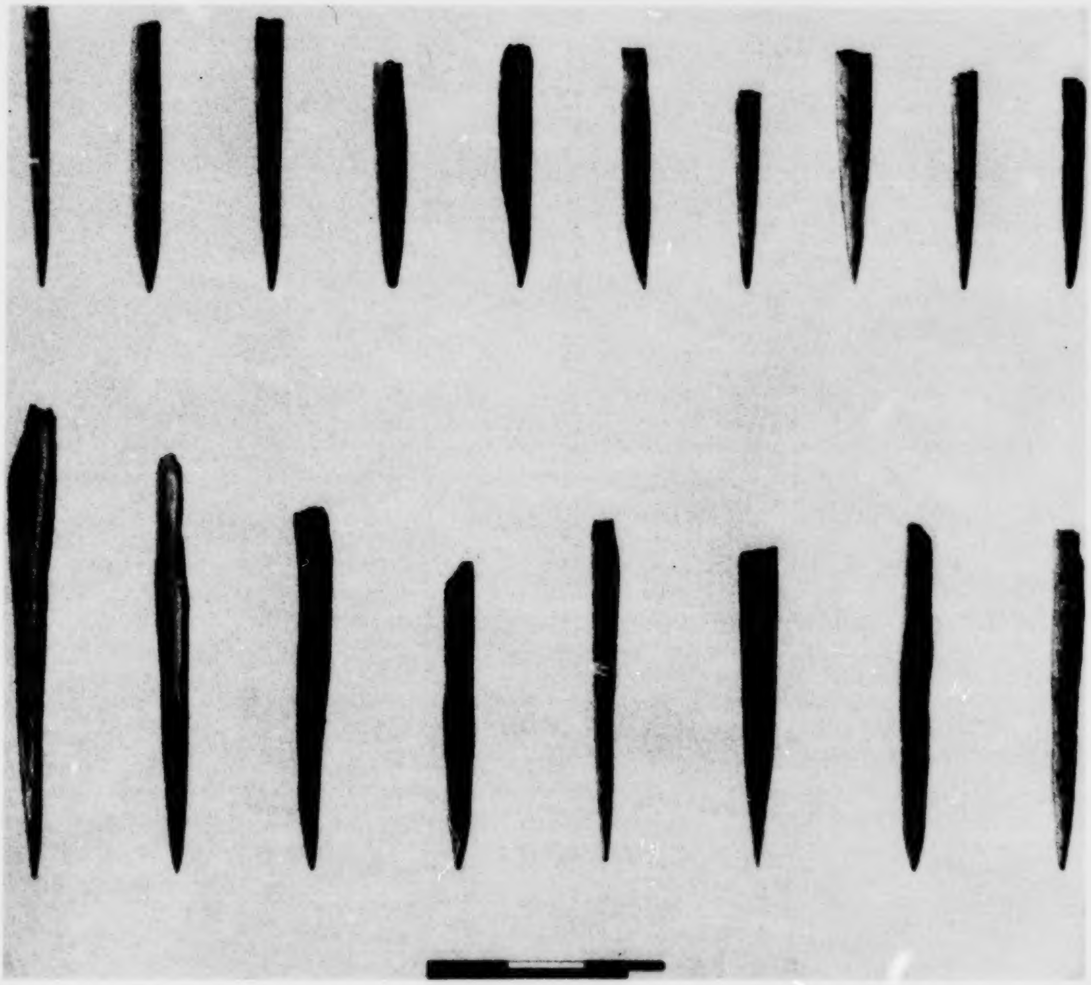


Figure 114. Small bird bone points with unfinished proximal ends.

The bird bone points with unfinished ends also strongly resemble the arming points of small U-shaped hooks. Such a hook collected from Nootka Sound in 1792 by Captain James Magee (PM Cat. No. 250) has a bird bone point cut and broken off proximally. It measures 38.5 mm long, 3 mm wide and 1.5 mm thick.

Whole bird bone points. Twenty whole shafts of bird bone have been ground to a point at one end; the remainder of the shaft is little or not modified (Fig. 115; Table 41). The point was formed by cutting away one side of the shaft at an angle of 5 - 10°, exposing the bone cavity. The adjacent two sides were then ground slightly inward to form a sharp point. The opposite ends are ground flat on only two artifacts; otherwise, the ends are broken and unfinished. Therefore, one cannot determine for certain whether the artifacts are uncompleted or fragmentary or complete but unfinished. Composite ethnographical artifacts indicate that the points could easily have been used with unfinished ends. The short points are obviously broken tips. The points were found in Zones IIa, III and IV.

Table 41. Whole Bird Bone Points: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Point Width	Point Thickness	Angle of Point (°)
IVe	1T1M1-1883	110	4	4	5
IVb	1T2G6-1340	104	5	3	5
IIId	1T2A8-5252x	55	3	3	5
IIIc	1T3A9-285	tip	4	4	5
IIa	1T1A22-5253x	tip	4	4	10
IIa	1T2A17-2733x	tip	5	4	10
IIa	1T3A19-928	54	3	4	10
IIa	1T3A20-1096	89	3	3	10
IIa	1T3B22B-1108	tip	6	5	10
IIa	1T2C19A-808x	tip	5	4	5
IIa	1T2C21A-1090	tip	5	4	10
IIa	1T2D23-2695x	105	4	4	10
IIa	1T1G18-2351	67	4	5	10
IIa	1T1J9-2280	88	4	3	5
IIa	1T1J21C-2618	77	4	5	10
IIa	1T1K15A-2211	63	5	4	5
IIa	1T1N6A-1977	101	3	3	5
no provenience	1T1C-2680	tip	5	4	10
	1T11-3100	125	4	5	10
	1T1X1-3168	tip	4	4	10

Dimensions (Table 41) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	54-125	86.5	23.30	12
point width	3-6	4.2	0.83	20
point thickness	3-5	4.0	0.69	20

This summary should not be regarded as representing a particular type with a well-defined use.

Nearly identical bird bone points are used in various ways on diverse ethnographical artifacts. Sharpened bird bone shafts with unfinished proximal ends were lashed as arming points to straight wooden shanked sharp-angled hooks used for cod. Dimensions of the longer Yuquot bird bone points fall easily within those of a series of 11 such cod hooks (AMNH Cat. Nos. 16/1702, 16.1/2258, 16.1/2259):

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	88-122	102.8	9.41	11
width	4-6	4.8	0.75	11
thickness	3-5	3.9	0.30	11

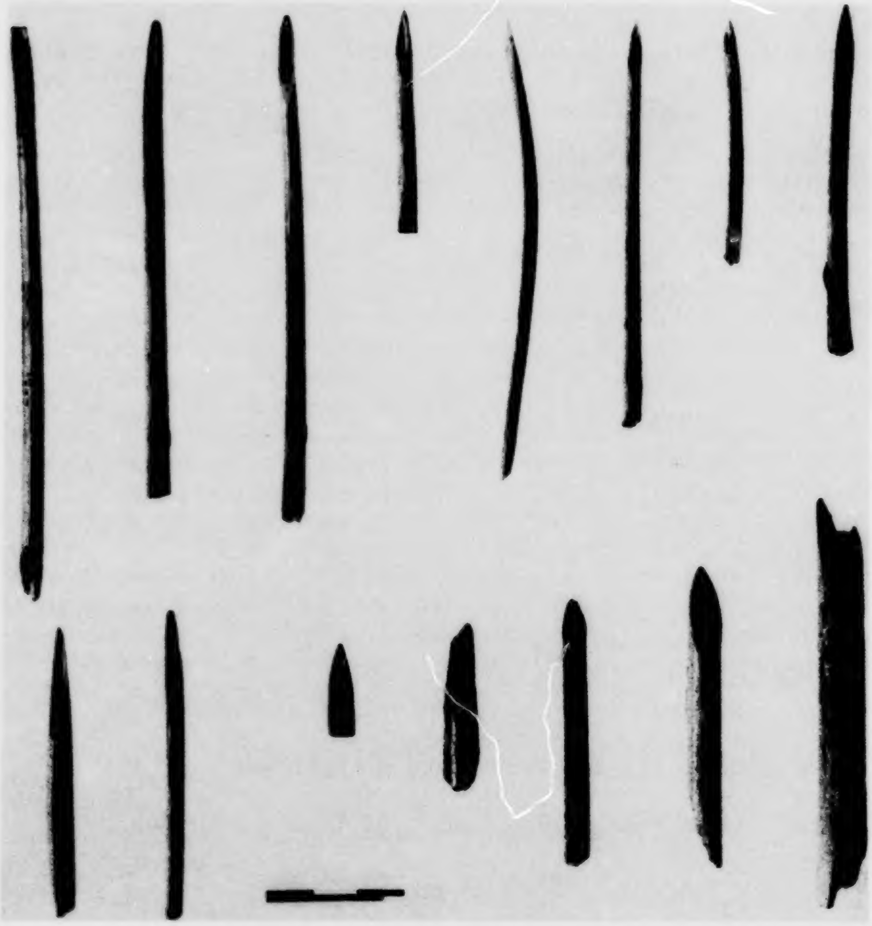


Figure 115. Whole bird bone points. Points in the top row and first three in the bottom row may have been arming points of composite fish-hooks. The last four points in the bottom row are large whole bird bone points and may have been armed leisters.

The long bird bone points also strongly resemble a bird bone needle with a slit eye and sinew string (BCPM Cat. No. 2248) collected from a midden at Nootka Sound. The short bird bone points could be fragments of gorges similar to some collected from Kyuquot (BCPM Cat. No. 9467) and described under miscellaneous gorges in this report.

Unbarbed points with flared ends. Two unusual points of land mammal bone have flared proximal ends (Fig. 94f,h). Cross sections are rectanguloid. Sides and faces reach maximum dimensions at the proximal ends and taper with straight sides to sharp distal points which form angles of about 5°. The proximal ends are ground slightly convex, at an oblique angle across. The surfaces of the proximal ends bear numerous abrasive striae. Dimensions are as follows:

Artifact No.	Length (mm)	Width (mm)	Thickness (mm)
1T2H13B-2340x	33.5	4	3
1T1X1-2664	45+	4	4

One artifact was recovered from Zone IIb; the other is without provenience.

Although the artifacts resemble possible bone punches or pins (cf. Fig. 94g), the proximal ends display no compaction and no pitting. No bone points resembling these were seen in the ethnological collections. It seems unlikely that these artifacts are unused punches or pins because the flared proximal ends would be prone to fracture from pressure or blows. Perhaps the points with flared proximal ends served as fish-hook points or clothing pins.

Sharp-angled points. Five artifacts fashioned from a remarkable variety of materials and elements have key attributes in common. They are points bending sharply upwards at angles of 15-30° from a flattened base. The artifacts occur in all four stratigraphic zones.

A distinctive point (Fig. 116) from the interface of Zones Ia and IIa appears to be based on a sea mammal rib. One end has been slightly tapered laterally. The excurvate side adjacent to it has been ground flat. The cross section here is plano-convex, owing to the natural convexity of the cortex. The artifact curves sharply upwards for approximately 20° from the base and terminates in a point. The sides of the point form an angle of about 10°. All surfaces are ground smooth. The distance between the flattened area and point tip is 52 mm. The artifact is 129 mm long, 13 mm wide and 7 mm thick.

A complete point of antler tine (Fig. 117a) from Zone IIa curves naturally to one side at a 30° angle near the distal tip. The tip is bifacially ground to a blunt point. The proximal portion of the tine is cut and ground into a rectangular-shaped base, trapezoidal in cross section. The flat contact surface of the base is 25 mm long. The base measures 14 mm wide and 7 mm thick. The distance between the edge of the base and the point tip is 75 mm. The artifact is 104 mm long.

A fragmentary point from Zone IIIc is also based on an antler tine (Fig. 117c). One end is ground to a straight point whose sides form an angle of approximately 15°. The point turns upward from a ground flat

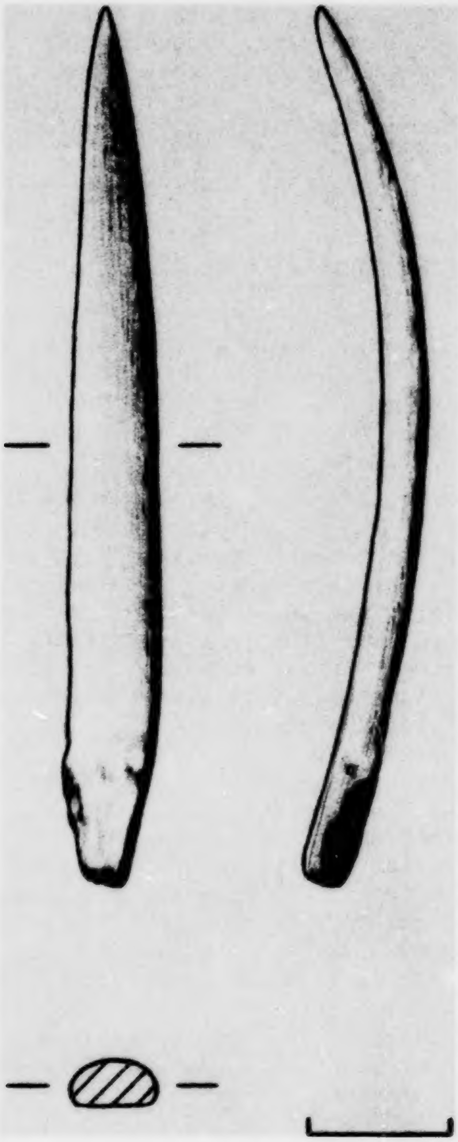


Figure 116. Large sharp-angled point (1T1J20D-2615). Whalebone. (Scale: 0-2 cm.)

base at an angle of 25°. The point, from its tip to the flattened base, is 52 mm long. The base, rectanguloid in cross section, is 14.5 mm wide and 7 mm thick. The proximal end is broken.

The smallest point (Fig. 117b), from Zone IVb, is a modified baculum of a small land mammal, perhaps a raccoon. The distal end is

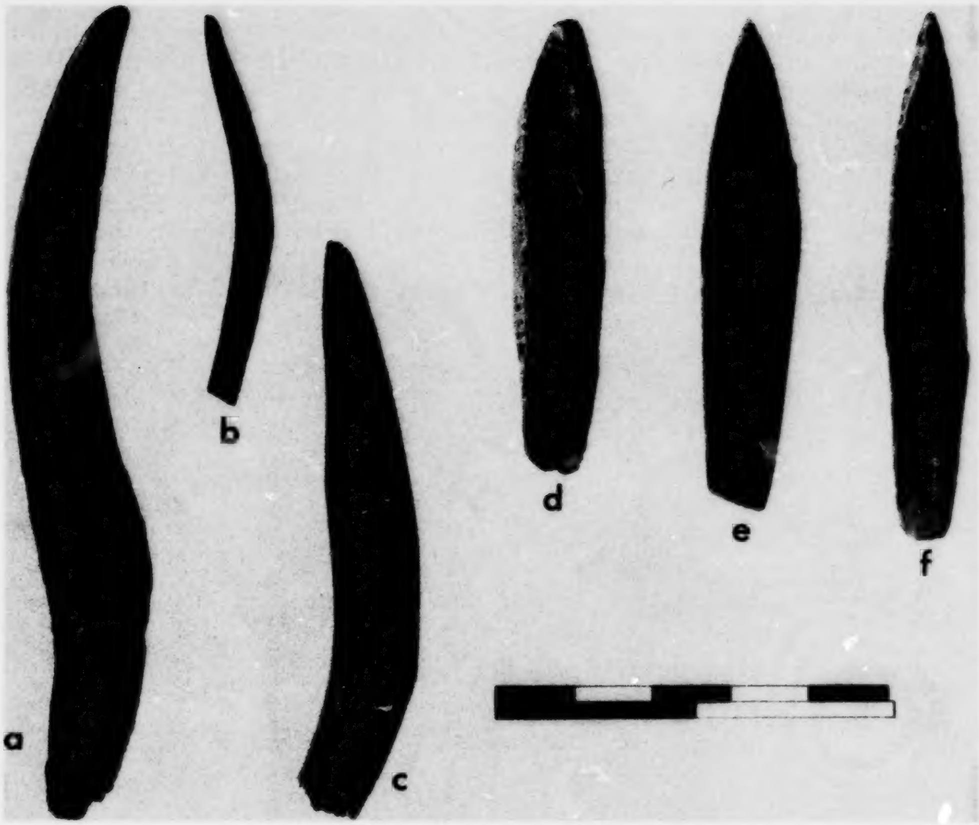


Figure 117. Sharp-angled points and short, stout unbarbed points. Sharp-angled points: a, 1T2G19-2150; b, 1T1M2B-3753x; c, 1T1B15A-779. Short stout unbarbed points: d, 1T2E3-1218; e, 1T3A6-229; f, 1T3B6-566. (Scale: cm, in.)

ground to a sharp point. It turns at an angle of 30° from a flattened ventral base. The projecting point is 30 mm long. The proximal end of the artifact has broken away. The artifact is calcined. It is 50 mm long, 4.5 mm wide and 4 mm thick.

A nearly intact point of antler (Fig. 118) was recovered without provenience. Several whittling facets and only few partly ground surfaces indicate that the artifact is likely either protohistoric or historic. The fragmentary pointed end is 58 mm long, and roughly round in cross section. It forms an angle of 15° with the flattened base. The base is trapezoidal in cross section and tapers to a rough point. The ground flat base is 52 mm long, with a maximum width of 14 mm. The artifact, when intact, was slightly longer than 110 mm.

Several stains on this artifact are significant for inference of its use, and by extension, the probable use of the other sharp-angled points. Several parallel, horizontal bands of reddish-brown stains (not shown in Fig. 118) can be seen on the three sides adjacent to the flat base and on all sides of the proximal half of the point near the base. No stains are visible on the flattened base. The stains are like those made by bands of cherry bark lashings on bone points fixed to fish-hook shanks and harpoon-leister arms studied in the ethnographical collections. The stains on the antler artifact suggest that the flat base served as a contact area, lashed with plant fibre against another surface of a composite artifact. The angles formed by the point and contact area are within the range of angles formed by bone points lashed to sharp-angled hooks (cf. Gunther 1972: fig. 49). The sharp-angled points likely armed composite fish-hooks of some kind. The large points

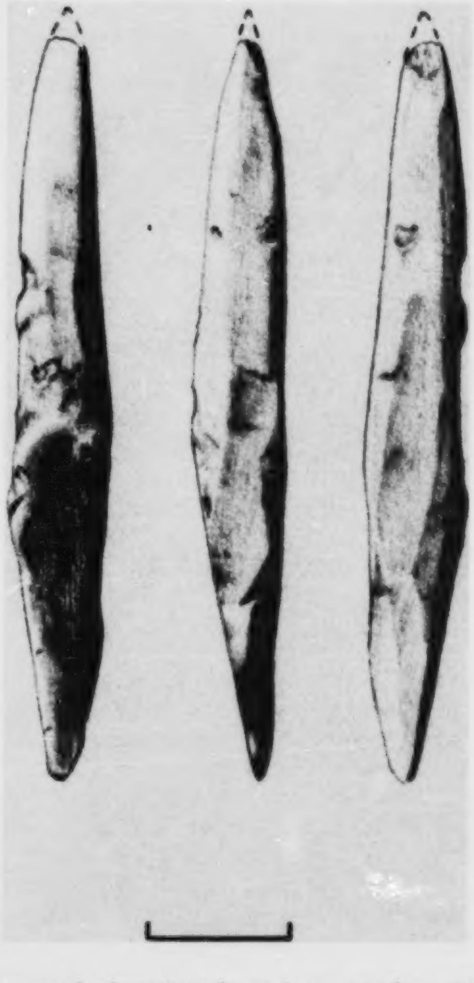


Figure 118. Sharp-angled point based on antler tine (1T1X1-3219). (Scale for Figs. 118-121: 0-2 cm.)

were perhaps for gigs or gaffs. No arming points resembling the artifacts were seen in the ethnological collections studied.

Shanks of Composite Fish-Hooks

Although arming points of composite fish-hooks are abundant at Yuquot, they do not indicate which type of fish-hook was used. The best and most direct evidence for the presence and forms of composite fish-hooks are the shanks to which the arming points were lashed. In contrast to the numerous points, only 41 shanks were recovered. The under-representation of shanks to points undoubtedly reflects a pattern evident from ethnographical and wet site artifacts; that is, most shanks were made of wood, which disintegrates under usual archaeological conditions.

The archaeological shanks of bone, antler and stone strongly resemble those on ethnographically known complete composite hooks. All the archaeological shanks indicate varieties of V-shaped composite hooks. Some have been identified from ethnographical materials as specialized trolling hooks. All the shanks, however, can fit comfortably within the broad category of general composite hook described and diagrammed by Drucker (1951: 22):

> The same type of hook was used for fishing cod, and for trolling for spring salmon, according to the season, and, in recent times, for catching dogfish. This hook was sharp-angled, with a single point. The base of the hook was made of spruce root, with a flat face and slightly curved back. Its lower end formed a slanted table, grooved to receive the point, which was a barbed splinter of hardwood or bone...

The Yuquot shanks likely represent earlier shapes and specialized varieties of the composite hook described above.

Bone fish-hook shanks. Twenty-six fish-hook shanks of land mammal bone, sea mammal bone and antler were collected from Zones II, III and IV. Two basic shapes are apparent: curved stemmed shanks and rectangular-based shanks. Each, when armed with a straight point, would have formed a distinctly different shaped fish-hook. The curved stemmed shanks formed a shallow-angled, but proportionately open, wide hook. A complete ethnographical specimen suggests that the curved stemmed shanks were armed with unilaterally single-barbed points. The rectangular-based shanks would have held the arming point close to and parallel to the stem, forming a shallow-angled hook with a narrow opening. It is not known whether the arming point of these hooks was barbed or unbarbed. The rectangular-based shanks appear to have been developed later than the curved stemmed shanks and are partly contemporaneous with them.

Curved-stemmed bone shanks. Five shanks of sea mammal and land mammal bone were recovered from Zones IIa and IIIc.

These artifacts are distinguished by a long, gracefully curving thick stem, which straightens into a small base containing the point bed

(Figs. 119-121, 126 cf; Table 42). The narrowest part of the shank is the proximal end of the stem. It has various attributes for line attachment: a lip or rim on the excurvate side (Fig. 119), a side indentation (Fig. 120) or two opposing side indentations. Stems are trianguloid in cross section. The incurvate side is the widest and flattest. The other two sides meet in a rounded edge running down the excurvate side. The stem thickens toward the base and attains maximum dimensions where it straightens abruptly into the base, forming a shoulder on the incurvate side. The point bed is a vertical groove, 2 to 4 mm wide, positioned variously on the base: on the straight wide side (Fig. 121), diagonally across two sides (Fig. 119) or across an outer side (Fig. 120). The side opposite the base curves slightly inward and flares at the bottom to form a slight lip or spur. These aided in lashing the arming point in its bed. The point, when affixed, would have been almost parallel to the proximal portion of the stem.

Only two curved stem shanks are complete (Figs. 119, 120). They are 61 and 70 mm long. Fragmentary specimens, when intact, were only about one-half as long, suggesting considerable variation in size. Dimensions (Table 42), however, are too incomplete for a meaningful summary.

Respondents did not identify the shanks. None of the shanks was found in context with an arming point. A complete composite fish-hook with a wooden curved stem shank remarkably similar to one of the Yuquot ones (Fig. 119) was collected on the Northwest Coast, perhaps at Nootka Sound, by Hewitt in 1792 (BM, Hewitt Coll., Vancouver 141). This wooden

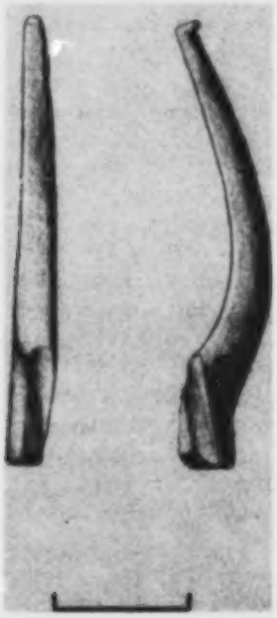


Figure 119. Curved-stemmed bone fish-hook shank from Zone IIa (1T2D22-2690).

shank is armed with a unilaterally single-barbed point, like those from Yuquot, secured with sinew (cf. British Museum 1925: 250, Fig. 256, no. 7).

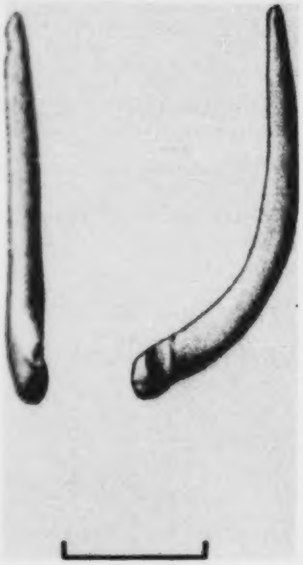


Figure 120. Curved-stemmed bone fish-hook shank from Zone IIIc (1T1E10-1492).

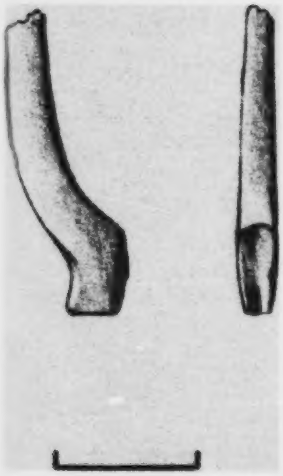


Figure 121. Fragmentary curved-stemmed bone fish-hook shank from Zone IIIc (1T1E13-2305).

Table 42. Bone Fish-Hook Shanks with Curved Stems: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Thickness	Length of Point Bed	Width of Point Bed	Depth of Point Bed	Wt (g)	Fig. No.
IIIc	1T2A12-3742x	25+	4	7	2	2	0.35+	126f
IIIc	1T1E10-1492	61	5	7	3	2	1.80	120
IIIc	1T1E13-2305	46+	6	13	4	2	2.10+	121
IIa	1T1B22A-946	28+	5	-*	-*	-*	0.40+	126c
IIa	1T2D22-2690	70	7	16	4	2	3.00	119

* Incomplete.

Rectangular-based bone shanks. Twenty-one shanks of antler, land mammal bone and sea mammal bone are characterized by a large square or rectangular base and a thin, wide stem three to four times as long as the base (Figs. 122-126; Table 43). The shanks are found in Zones III and IV.

The shanks are relatively uniform in shape. Although the stem and base are very thin, they are wedge-shaped or tear-shaped in cross section; the thick side faced the arming point on the complete hook. The thick side of the stem is straight or slightly incurvate; the thin side is slightly excurvate. Most proximal tips have, for line attachment, two to five notches sawed into opposing sides, or two to four notches sawed into the thin side and a vertical groove in the thick side. The rectangular- or square-shaped base stands out sharply in almost a right-angled shoulder from the thick side of the stem. This curved shoulder probably aided in lashing the arming point to the shank. The point bed, sawed into the entire length of the thick edge of the base, is roughly parallel to the stem. The thin edge of the base, opposite the point bed, has from one to four notches and a small spur at

Table 43. Bone Fish-Hook Shanks with Rectangular Bases: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Shoulder Thickness	Length of Point Bed	Width of Point Bed	Depth of Point Bed	Wt (g)	Fig. No.
IVa	1T1B7-5323x	38+	3	-*	-*	-*	0.7	126h
IVa	1T2C4-5402x	-*						
IVa	1T1D8-2039	69	5	13	2	3	3.4	124
IVc	1T1G10B-1889	64+	4	-*	-*	-*	1.5	122
IIId	1T3A8-3737	57	3	9	1	1	0.7	126d
IIIc	1T3C11-2929x	45+	5	14	1.3	1	3.4+	122
IIIc	1T2B12-3814x	stem	-**	-**	-**	-**	-**	122
IIIc	1T3B12-2858x	60+	5	13	frag.	frag.	3.6+	122
IIIc	1T1C11-404x	35+	5	15	2	1	2.7	122
IIIc	1T1D10-2083	79+	-**	-**	-**	-**	-**	122
IIIc	1T1D11-5292x	frag.	4	9	2	1	-**	122
IIIc	1T1D15B-3834x	tip	-**	-**	-**	-**	-**	122
IIIc	1T1D16A-3566x	30	3	6	1	frag.	0.3	126f
IIIc	1T1D16A-2593	stem	-**	-**	-**	-**	-**	126
IIIc	1T1D16A-3565x	stem	-**	-**	-**	-**	-**	126
IIIc	1T2D9-5437x	55	4	10	2	1	-**	122
IIIc	1T2D11-2293	35+	3	frag.	frag.	frag.	0.3+	126
IIIc	1T2D14B-2399	44+	3	-*	-*	-*	0.9+	122
without provenience	1T1X1-3061	52+	4	-*	-*	-*	0.35	122
	1T1X1-3215	76+	5	19	3	1	5.50	123
	1T1X1-3226	54	4	10	2	1	1.5	125

* Uncompleted.
** No data.

the bottom of the base. All these held lashings for the arming point in place. The bottom of the base is ground flat.

The shanks vary considerably in size (Table 43). The largest nearly complete shank measures 76 mm long, the smallest, 30 mm long. These extremes suggest usage differences according to size, but the shanks do not form apparent size clusters.

None of the shanks was recovered with its arming point. Respondents did not recognize the shanks. Although the shanks were found in historic period deposits, no complete composite hooks with these shanks appear to have been collected.

The shanks, when armed with a straight point, would have formed a shallow-angled hook with a narrow opening. In this respect the shanks are similar to the bent stem stone shanks, which may represent a refined trolling hook.

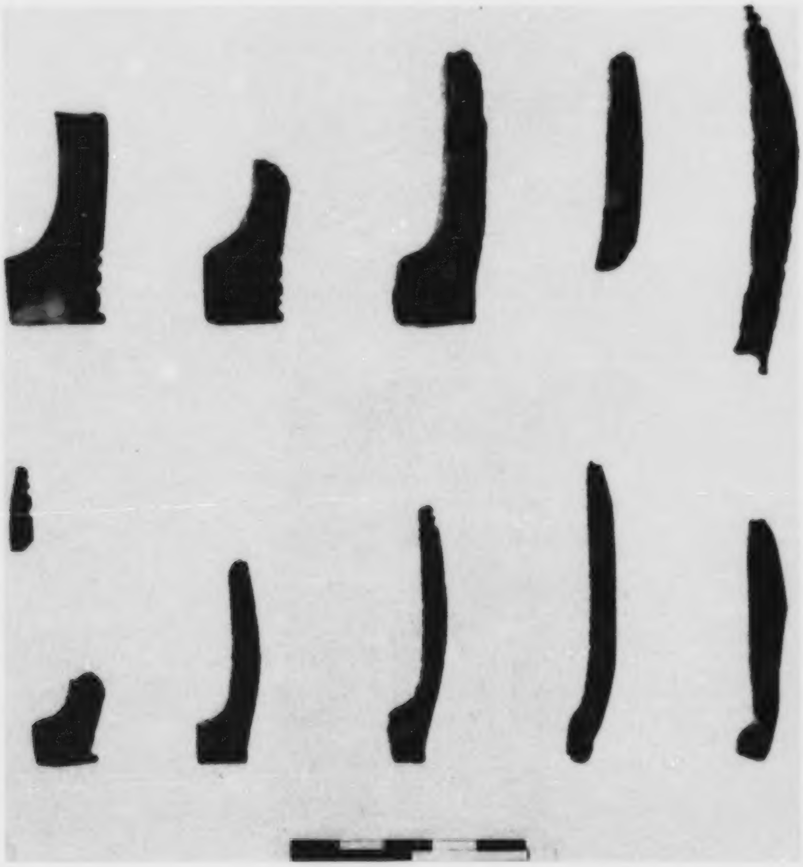


Figure 122. Rectangular-based bone fish-hook shanks.
Top row (left to right): 1T3C11-2929x; 1T1C11-404x; 1T3B12-2858x; 1T2B12-3814x; 1T1D10-2083. Bottom row: 1T1D15B-3834x; 1T1D11-5292x; 1T2D14B-2399; 1T2D9-5437x; 1T1G10B-1889; 1T1X1-3061.
(Scale: cm, in.)

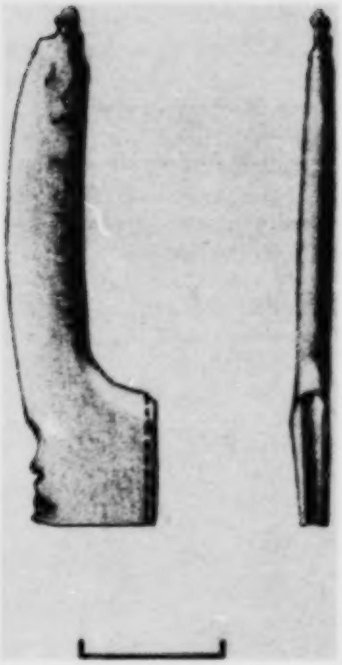


Figure 123. Complete rectangular-based bone fish-hook shank (1T1X1-3215). (Scale for Figs. 123-125: 0-2 cm.)

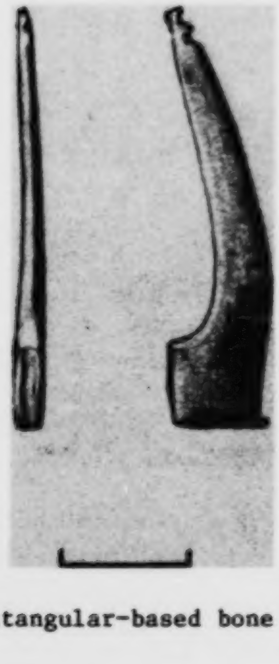


Figure 124. Complete rectangular-based bone fish-hook shank from Zone IVa (1T1D8-2039).

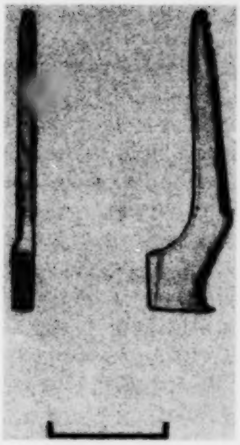


Figure 125. Complete rectangular-based bone fish-hook shank (1T1X1-3226).

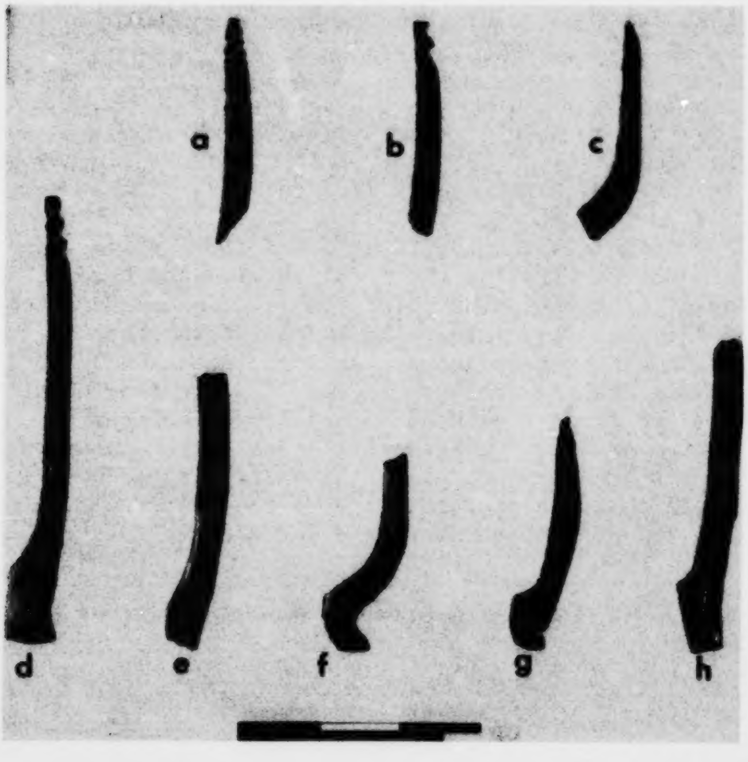


Figure 126. Bone fish-hook shanks. Curved-stemmed shanks: c, 1T1B22A-946; f, 1T2A12-3742x. Rectangular-based shanks: a, 1T1D16A-2593; b, 1T1D16A-3565x; d, 1T3A8-3737x; e, 1T2D11-2293; g, 1T1D16A-3566x; h, 1T1B7-5323x. (Scale: cm, in.)

Stone fish-hook shanks. Fifteen artifacts from Zones III and IV are stone shanks of composite fish-hooks. None of the shanks, as commonly supposed, is made of slate. Most are tuffs or other light volcanic materials (see Tables 44, 45; Muller 1979). None of the shanks was recovered with its arming point. Respondents did not recognize the shanks. They seem to have discontinued relatively early in the 19th century. Few complete stone-shanked composite fish-hooks have been collected ethnographically. They appear to be specialized trolling hooks for salmon (Drucker 1963: plate 3, bottom centre; 1965: 18).

The complete specimens and the Yuquot archaeological shanks both suggest two basic shapes of trolling hooks: sharp-angled hooks with straight stems, and shallow-angled hooks with bent stems. The former is represented by the ethnographical hook (AMNH Cat. No. 16/1713) reported by Drucker as cited earlier, and by the Yuquot rectangular-based shanks and most of the Yuquot miscellaneous shanks. Although the shape of all these shanks varies somewhat, the end result is a V-shaped hook with a straight, unbarbed bone point held outwards at an angle of about 20° to the shank. The shallow-angled, bent-shanked hooks are represented by an ethnographical hook (MAE Cat. No. 3455) illustrated by Stewart (1977: 44) and by the Yuquot bent-stemmed shanks. These are perhaps a late refinement that allowed trolling hooks to be baited more easily with whole herring, thereby avoiding the problem with sharp-angled hooks described by Drucker (1951: 40-41).

Rectangular-based stone shanks. Five shanks (Figs. 127-130; Table 44), mostly fragmentary, resemble the rectangular-based bone shanks. The base of the shank is roughly square or rectangular in outline. It projects from one side of the stem, forming a shoulder on that side of the shank. The longer side of the base contains a saw groove which served as a bed for the arming point. The point beds are not parallel to the stem, but lean outward at angles of 10 - 25°. The side opposite the point bed is indented or notched above a basal spur to hold lashings. The bottom of the base is ground flat. Cross section of the base is more or less rectangular. Stems are straight, and roughly oval in cross section. Only one proximal tip is intact (Fig. 127). It is a flat knob set off from the stem by a horizontal encircling groove. Two opposing sides of the knob are each cut by a vertical saw groove which joins the encircling groove. A respondent suggested that the vertical grooves recessed the fishing line, thereby allowing attachment of the leader without a bulgy knot.

Table 44. Stone Fish-Hook Shanks with Rectangular Bases: Proveniences and Measurements (mm)

Zone/Stratum	Artifact No.	Length	Shoulder Thickness	Length of Point Bed	Width of Point Bed	Depth of Point Bed	Wt (g)	Material*	Fig. No.
IVa	1T2D4C-2224x	58+	8	12	3	1	6.6+	BA	129
IIIc	1T3A15-884x	91	10	26	3	1	23.2	D	127
IIIc	1T1C13-842x	45+	-**	-***	-***	-***	-***	BA	128
IIIb	1T2M8-2558	45+	8	12	3	1	5.7+	DTF	130
IIIb	1T2L8-1991	uncompleted in early stages of manufacture						DTF	

* Stone types are identified by Muller (1979).

** Uncompleted.

*** No data.

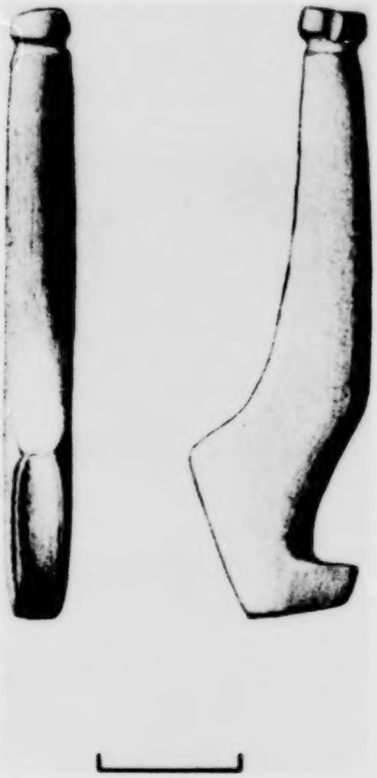


Figure 127. Complete rectangular-based stone fish-hook shank from Zone IIIc (1T3A15-884x). (Scale for Figs. 127-138: 0-2 cm.)

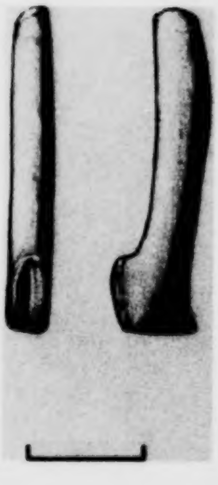


Figure 128. Broken uncompleted rectangular-based stone fish-hook shank from Zone IVa (1T2D4C-2224x).

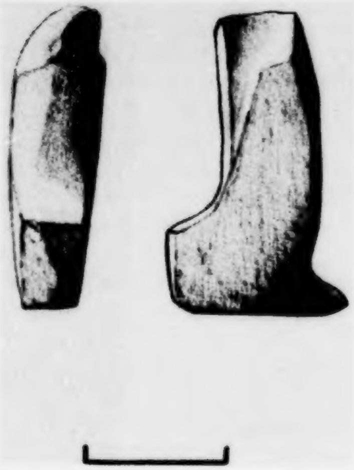


Figure 129. Broken uncompleted rectangular-based stone fish-hook shank in early stages of manufacture (1T1C13-842x) from Zone IIIc.

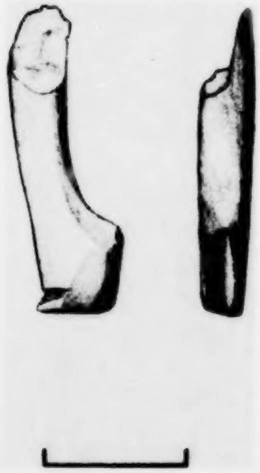


Figure 130. Fragmentary rectangular-based stone fish-hook shank from Zone IIIb (1T2M8-2558).

One shank is uncompleted and broken (Fig. 128). Another appears to have broken in the early stages of shaping (Fig. 129).

The shanks are too fragmentary for a meaningful summary of dimensions (Table 44). Only one shank (Fig. 127) is complete and it appears noticeably larger than apparent original lengths of the other shanks.

The rectangular-based shanks were found in Zones III and IV.

Bent-stemmed stone shanks. The bent-stemmed shanks are characterized by a sharp bend of the proximal third of the stem toward the point bed. This single attribute was chosen as a basis of classification, because the bent stems suggest a refinement in fishing. Only three artifacts were recovered: one complete specimen and two proximal stem fragments broken at the bend. Presumably the latter originally resembled the complete shank.

The complete bent stem shank (Fig. 131) from Zone IVb is made of feldspathic argillite (Muller 1979). The proximal third of the stem bends at a 70° angle toward the point bed. The tip of the stem is ground flat. Just below it are lashing grooves for attachment of a leader. They consist of two parallel horizontal encircling grooves cut through on the back of the stem by a vertical saw groove. The stem is ovoid-rectangular in cross section, becoming increasingly rectangular toward the base. The stem merges directly into the base without an indentation or strongly curved shoulder just above the point bed. The extreme angle of the stem where it joins the base, however, may have been sufficient to serve as a shoulder. The base is roughly rectangular

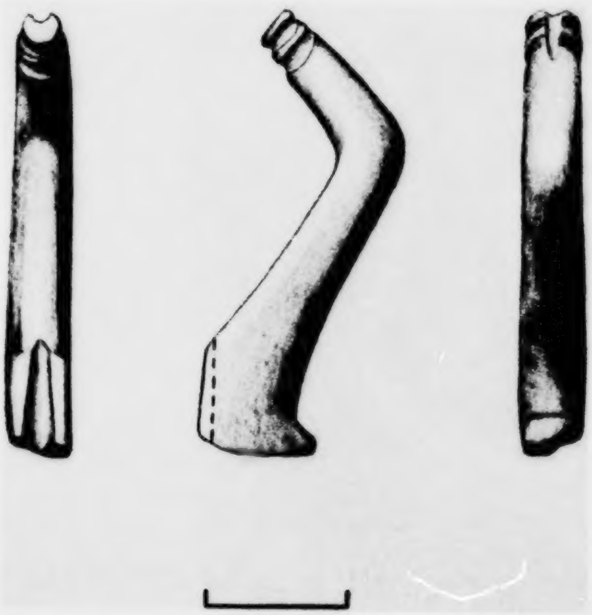


Figure 131. Complete bent-stemmed stone fish-hook shank from Zone IVb (1T1H7B-1487).

with a nearly flat bottom, a basal spur on one side and a point bed on the opposite side. Unlike the rectangular-based stone shanks, the point bed of the bent stem shank is cut nearly at a right angle to the base. This would have held the arming point close to the stem, thereby forming a hook less sharp-angled than the rectangular-based shanks with straight stems. The point bed is 16 mm long, 2 mm wide and 2 mm deep. The shank is 65 mm long, 9.5 mm thick and weighs 15.6 g.

The two stem fragments, both of fine-grained dacite tuff (Muller 1979), were recovered from the upper levels of Zone IIIb and without provenience. Both fragments have line attachment grooves similar to those on the complete shank, but instead the vertical groove faces the arming point (Figs. 132, 133). The proximal ends and one side of one specimen are ground flat. The thickness and proportions of the bent

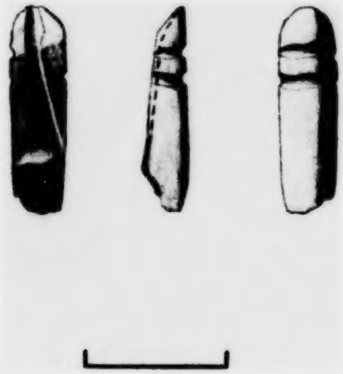


Figure 132. Stem fragment of bent-stemmed stone fish-hook shank from upper levels of Zone IIIb (1T2H7-1877x).

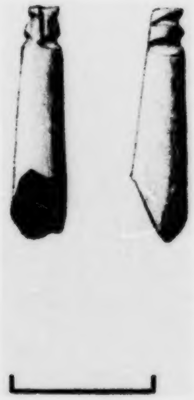


Figure 133. Stem fragment of bent-stemmed stone fish-hook shank (1T1X1-3551).

stem fragments suggest that the intact shanks were approximately the same size as the complete shank described above.

A complete composite hook with a bent stem shank is armed with an unbarbed bird bone point secured with sinew lashing (Stewart 1977: 44). This museum specimen indicates the shallow angle of the complete hooks, as suggested by the bent stem and point bed angle on the complete shank from Yuquot.

The bent-stemmed shanks may represent a specialized or refined trolling hook for salmon. A respondent who had fished commercially for many years suggested that the shallow-angled hooks with bent shanks could fit more easily than a wide-angled hook into whole herring used as bait in trolling for spring salmon.

Other stone shanks. Seven stone shanks (Table 45), either too fragmentary or too different to be included with the other classes, are described separately below.

A complete shank (Fig. 134) from Zone IIIc resembles the curved

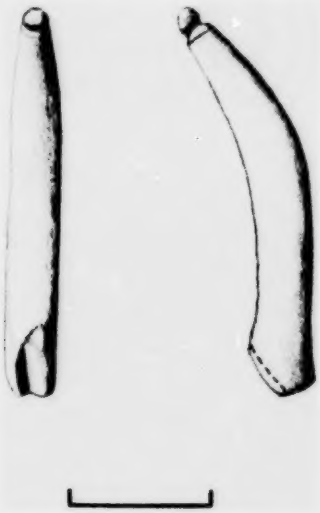


Figure 134. Complete stone fish-hook shank from Zone IIIc (1T1F8-1268).

Table 45. Miscellaneous Stone Fish-Hook Shanks: Proveniences and Measurements (mm)

Zone/Stratum	Artifact No.	Length	Thickness	Length of Point Bed	Width of Point Bed	Depth of Point Bed	Wt (g)	Material*	Fig. No.
IVa	1T2E5-2787x	stem	-**	-**	-**	-**	-**	BA	
IVa	1T1F8-1275	59+	-**	-**	-**	-**	8.1	BTA	138
IVb	1T2H6C-1864	69+	13	13+	4	3	25.6	FGM	135
IVb	1T1M3-1899x	44+	12	21	3	2	12.2+	DTF	137
IIIc	1T2E7-1277x	stem	-**	-**	-**	-**	-**	DTF	
IIIc	1T1F8-1268	59	8	9	3	1	6.3	BTA	134
without provenience	1T1X1-3310	38+	12	-**	-**	-**	10.5+	FAr	136

* Stone types are identified by Muller (1979).
** No data.

stem bone shanks in outline and general appearance. The proximal tip is a small rounded knob set off by a single encircling horizontal groove. The gently curving stem is ovoid to rectangular in cross section. The base is more a continuation of the stem than a projecting enlargement. There is no well-defined depression or shoulder just above the point bed, but the angle at which the stem merges into the base may have served as a shoulder. The side opposite the point bed is slightly concave, but without a basal spur. The bottom of the shank is ground flat. This is the smallest stone shank found at Yuquot. It is 59 mm long and 8 mm thick. The point bed is 9 mm long, 3 mm wide and 1 mm deep. The point bed is at a 20° angle to the stem, which would produce a sharp-angled hook. The shank weighs 6.3 g.

An unusually thick and heavy shank (Fig. 135) missing the distal part of its base was recovered from Zone IVb. Cross section is rectanguloid. The proximal tip of the stem is ground flat and set off by two widely spaced encircling horizontal grooves. They are cut through, on the side with the point bed, by a single vertical saw groove. This side is indented across just above the point bed. The base containing the point bed is really part of the stem. A single horizontal lashing groove has been sawn into three sides of the shank at the top of the point bed. The point bed, 4 mm wide and originally more than 13 mm long, is at a 15° angle to the shank. This would form a sharp-angled hook.

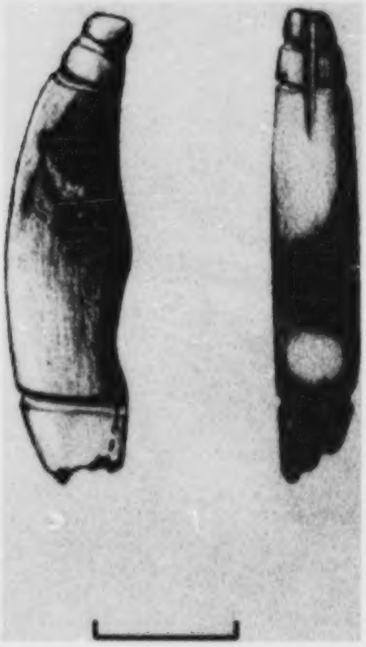


Figure 135. Fragmentary stone fish-hook shank from Zone IVb (1T2H6C-1864).

A shank fragment without provenience includes only the mid-portion of the stem and a horizontal lashing groove at the top of the point bed (Fig. 136). This shank was probably somewhat like the shank described above.

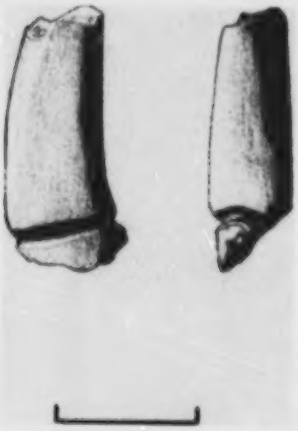


Figure 136. Fragment of a stone fish-hook shank (1T1X1-3310).

A shank fragment from Zone IVb consists of the base and lower part of the stem (Fig. 137). The stem is round to oval in cross section. Directly above the point bed is a slight indentation or depression. The point bed is 21 mm long, 3 mm wide and 2 mm deep. It slopes away from the stem at approximately a 20° angle. The composite hook, therefore, would be sharp-angled. The bottom edge of the base flares on three

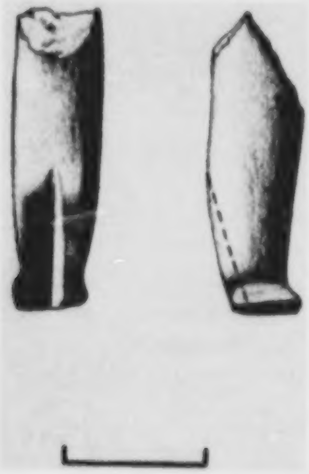


Figure 137. Basal fragment of a stone fish-hook shank from Zone IVb (1T1M3-1899x).

sides to form a lip or spur for holding the lashings. Above the lip on the two sides adjacent to the point bed is a shallow groove. The bottom of the base is ground flat. A fragment from Zone IIIc is a stem without a base (Fig. 138). Cross section is oval. The top of the stem is ground flat. Lashing grooves for attachment of a leader are absent, which may indicate that the shank was uncompleted. Perhaps the base broke during manufacture, and the fragments were discarded. The straight, slender stem shape suggests a rectangular-based shank.

Two small fragments of stems, not illustrated, were recovered from Zones IIIc and IVa (Table 45).

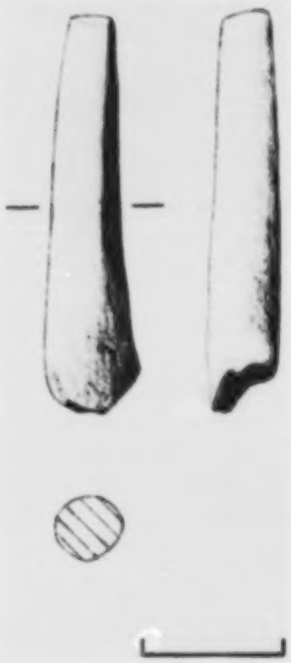


Figure 138. Stem fragment of a stone fish-hook shank from Zone IVa (1T1F8-1275).

Gorges

Seventy-six artifacts of land mammal bone and bird bone are probably gorges. These are small bipoints, which were baited and set out on lines for fish and birds. When swallowed, the gorge catches in the animal's throat.

Respondents, when shown the gorge artifacts, explained that the gorges were baited with any kind of fish and used with nettle fibre lines to catch small inshore pelagic fishes such as cod, red snapper, rockfish and shiners. Several fishes were named in Nootkan, but the actual species could not be determined. They appeared to be kinds of small inshore pelagic fishes. According to respondents, gorges were also baited with herring and set out on multiple lines for ducks. It was not possible to determine which attributes, if any, were preferred for fish or for ducks. Gorges are known ethnographically to have been used for ducks (Drucker n.d. a: vol. 1, pp. 44, 68 and vol.2; 1951: 34) and for kelpfish (Curtis 1916: 178; Drucker n.d. b).

The gorge artifacts, unlike the unbarbed bone points of composite fish-hooks, are truly bipointed in that both ends are carefully sharpened for piercing. Gorges may be spindle-shaped, notched, indented or curved to facilitate attachment of a line. These basic attributes of true bipointedness and line attachment are expressed in various shapes, sizes and perhaps materials. Eleven varieties have been distinguished here. Most are probably an arbitrary classificatory convenience, but some have limited distribution in time and may represent functional varieties.

Large gorges. Seven gorges of split or sectioned land mammal bone (Fig. 139; Table 46) are appreciably larger than any others in the

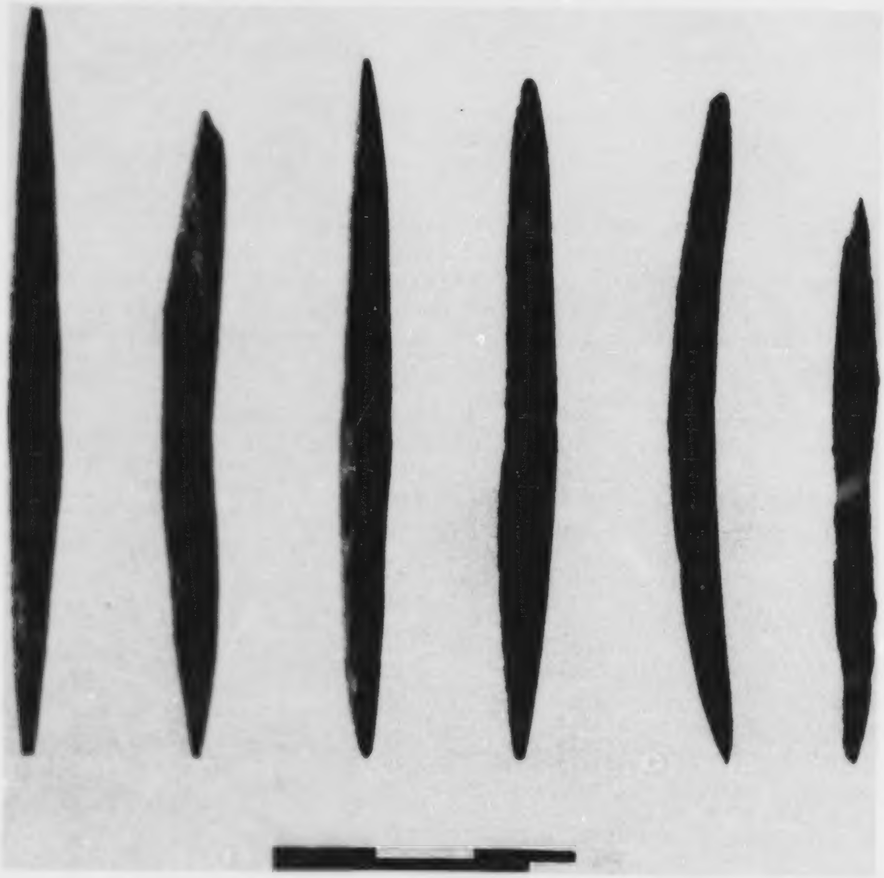


Figure 139. Large gorges. (Scale for Figs. 139-147: cm, in.)

assemblage. These gorges strongly resemble the unbarbed biconvex points of composite fish-hooks, but both ends are carefully sharpened and the middle is slightly indented on one side or one face for line attachment. Two specimens have reddish-brown stains, perhaps from plant fibre lashings, at or near the indentation. Cross section is rectanguloid.

Table 46. Large Gorges: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVd	1T1B2B-520	74	5	5
IVd	1T1C2-103	70	4	5
IVc	1T1G7-1839x	66	6	4
IVb	1T1K2A-1413	68	4	5
IVb	1T1K3-1433	57+	5	4
IIIc	1T2E11-1296	69	6	4
IIb	1T2J12A-2146x	32+	5	3

Dimensions (Table 46) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	66-75	69.6	3.36	5
width	4-6	5.0	0.82	7
thickness	3-5	4.29	0.76	7

The large gorges were found in Zones II, III and IV.

Indented gorges. Thirteen gorges (Fig. 140; Table 47), round or oval in cross section, are indented once or more at or near the middle for line attachment. All, but one of bird bone, appear to be of land

Table 47. Indented Gorges: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVd	1T1A10-411	50	3	3
IVd	1T1F3-1046x	36+	3	3
IVc	1T2H6C-1863	57	3	3
IVb	1T1K3-1434x	42	2	2
IIIc	1T1D17A-2596	52+	3	3
IIIc	1T1E13-2307*	42	2	2
IIIc	1T1E13-2702*	41	2	2
IIIc	1T1E13-2703*	42	2	2
IIIc	1T1E13-2704*	31	2	2
IIIc	1T1E13-2705*	40	2	2
IIIb	1T2L8-2118	33	3	2
IIa	1T3A17B-3557x	41	3	3
IIa	1T2J16-2648	42	2	2

* Found together in context.

mammal bone. Dimensions (Table 47) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	31-57	41.90	7.05	11
width	2-3	2.46	0.59	13
thickness	2-3	2.38	0.51	13

The indented gorges were found in Zones IIa, III and IV.

Of particular interest are five indented gorges (Fig. 140) found in context as a group. They demonstrate the narrow range of dimensions of several gorges used together (Table 47). These gorges are remarkably similar to six complete Nootkan gorges collected before 1893 (NMM VII-F-290a-e). They are nearly round in cross section and tied near the middle with sinew to lines of nettle fibre. Dimension ranges: length, 49 - 58.5 mm; width, 2 - 3.5 mm; thickness, 2 - 3.5 mm.

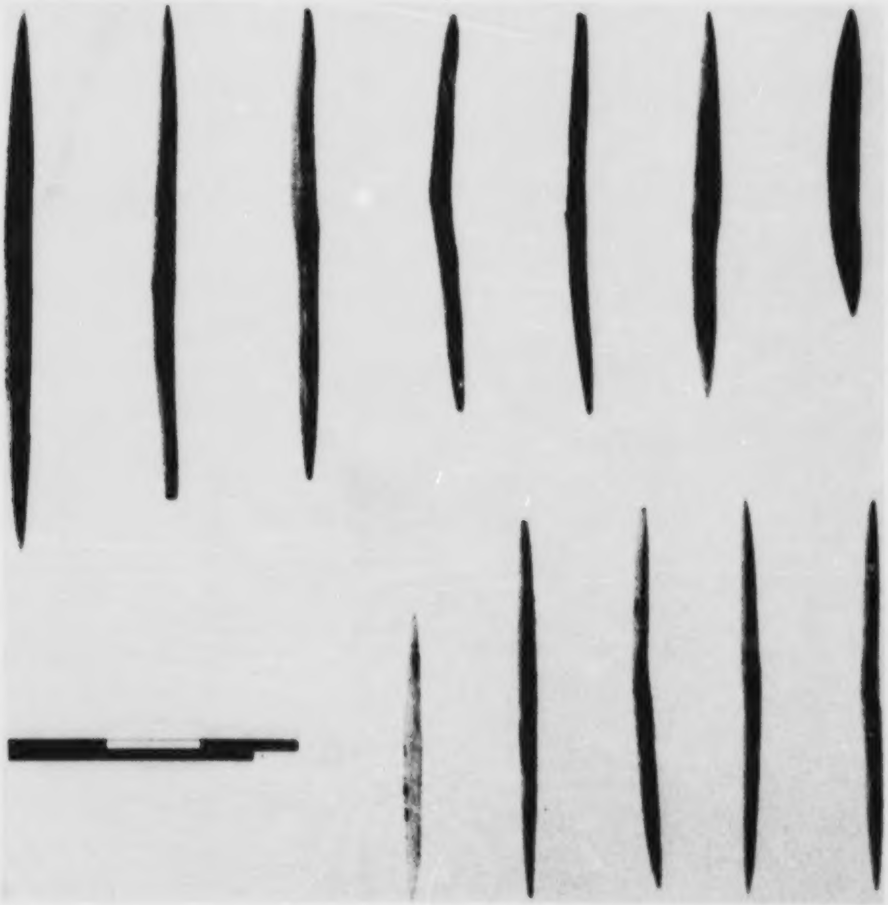


Figure 140. Indented gorges. The five specimens in the bottom row were found together in context.

Plain round gorges. Eight gorges of land mammal bone and bird bone (Fig. 141; Table 48) from Zones III and IV are round to rectanguloid in cross section. None have notches or indentations for line attachment. The spindle shape, however, may have aided line attachment. Some specimens have horizontal bands or blotches of reddish-brown stain, possibly from plant fibre lashings, about the

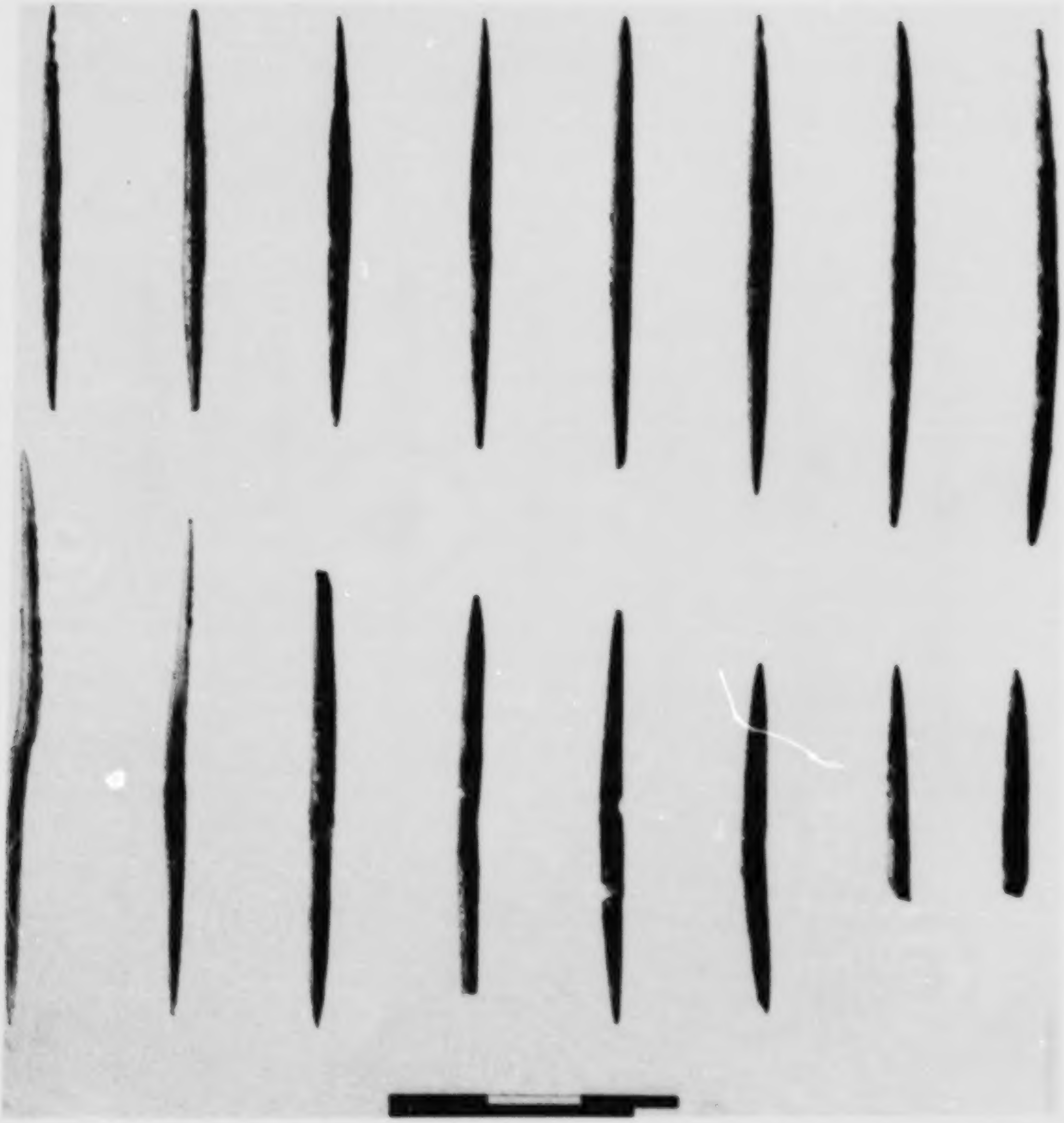


Figure 141. Round gorges. Top row: plain round. Bottom row: notched round.

Table 48. Plain Round Gorges: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVc	1T1G8B-1598	42	3	3
IVb	1T2H5A-1831	43	3	2
IIId	1T1A7B-341	42	2	2
IIIc	1T2D16-2420	45	3	2
IIIc	1T1E7-1408x	53	3	2
IIIc	1T1E10-1464	54	3	2
IIIc	1T1F8-1271	47+	3	2
no provenience	1T1X1-3164	50	3	3

midportion. Dimensions (Table 48) are nearly uniform:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	42-54	47.00	5.23	7
width	2-3	2.88	0.35	8
thickness	2-3	2.25	0.46	8

Notched round gorges. Eight gorges of land mammal bone (Fig. 141; Table 49) are round or oval in cross section and have one or more side notches in the middle. Two have opposing notches, while one has a single notch with an opposing indentation. One is bent in the

Table 49. Notched Round Gorges: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVa	1T1B7-663x	37	3	2
IIId	1T2A9-641x	25+	3	3
IIId	1T1B10-685x	43	3	2
IIIc	1T2C12-829	52	3	2
IIIc	1T2D15-2401	60	3	3
IIIc	1T2F12C-2314x	42+	3	2
IIa	1T1D19-2655	48+	3	3
IIa	1T2F14A-2350x	24+	3	3

middle at the opposing side notches. Dimensions (Table 49) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	37-60	48	10.10	4
width	3	3	0.0	8
thickness	2-3	2.5	0.53	8

The notched round gorges are found in Zones IIa, III and IV.

Plain flat gorges. Eleven gorges of split birdbone (Fig. 142; Table 50) are flat and rectangular in cross section, apart from the remaining naturally concave surface of the inner cavity of the bone. One specimen has well-made opposing side indentations, off-centre, for line attachment. The other gorges have no apparent attributes to assist line attachment. Dimensions (Table 50) are quite limited:

Table 50. Plain Flat Gorges: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVb	1T1G7A-1858	47	3	1.5
IVb	1T2H4-1801x	44	2	1.5
IVb	1T1J2-1629	44+	3	2.0
IVb	1T2J3B-1387	53	3	2.0
IVb	1T2J4A-1447	53	3	1.5
IVb	1T1L2A-1644	51	2	1.0
IVb	1T2L2A-1902	44	3	1.5
IVb	1T2L2A-1909x	38	3	1.5
IIIc	1T3B14-780x	43	4	1.5
IIa	1T2G13B-2036x	48+	3	1.0
no provenience	1T1X1-3275	41	3	1.0

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	38-53	46.0	2.91	9
width	2-4	2.9	0.54	11
thickness	1-2	1.45	0.35	11

The plain flat gorges are found in Zones II, III and IV.

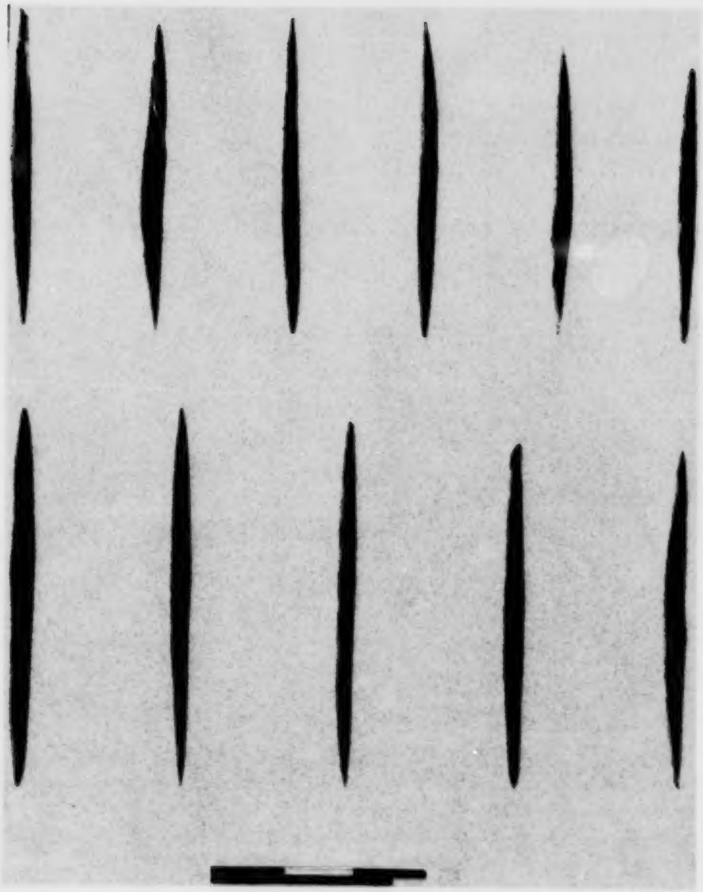


Figure 142. Plain flat gorges.

Notched flat gorges. Six gorges are flat to rectangular in cross section with a single side notch in the middle (Fig. 143; Table 51). One specimen has two opposing side notches. One gorge is made

Table 51. Notched Flat Gorges: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVa	1T1D7-2028	34	3	1.5
IIId	1T1B9-680x	38	3	2
IIIc	1T3A10-3585x	29+	3	1.5
IIIc	1T3C10-415x	45+	4	2
IIIc	1T1E11-1504	34+	3	2
IIa	1T1G19B-2500	23+	3	1.5

from land mammal bone; the others are of split or sectioned bird bone. All are similar in size (Table 51):

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	34-38	36.0	-	2
width	3-4	3.17	-	6
thickness	1.5-2	1.75	-	6

The notched flat gorges were found in Zones IIa, III and IV.

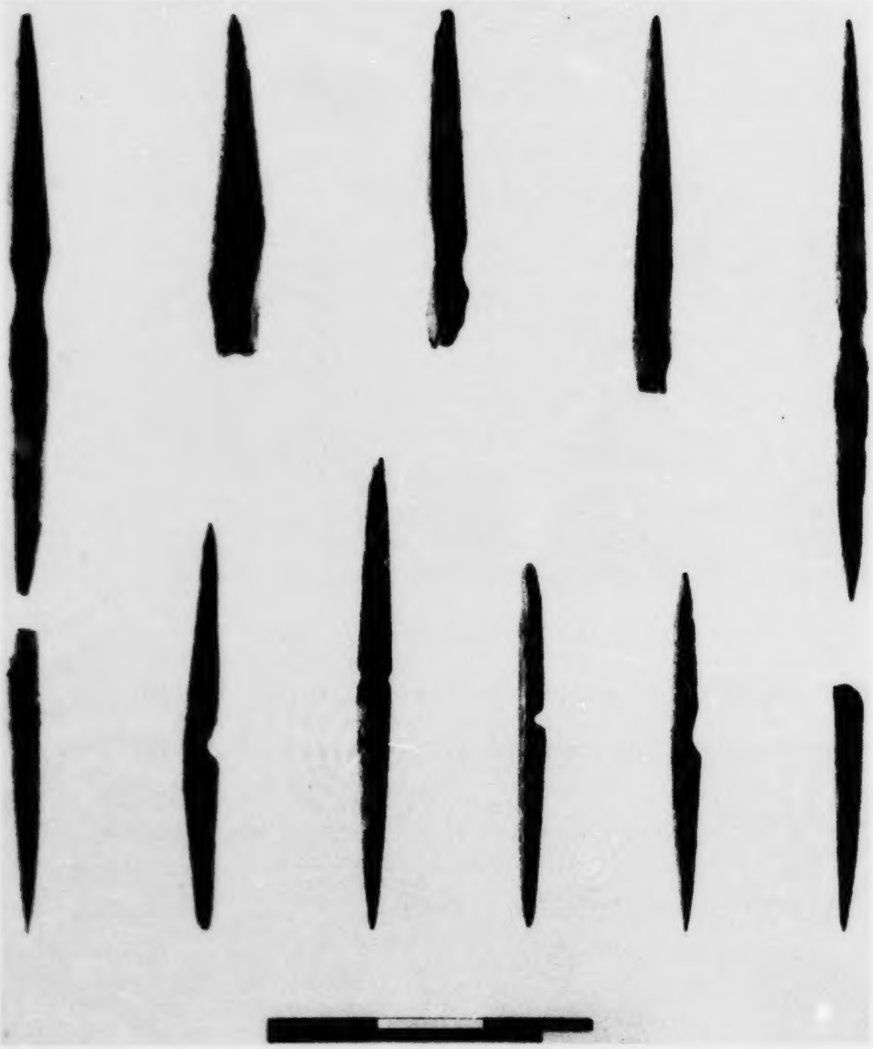


Figure 143. Gorges. Top row: double-indented rectangular. Bottom row: notched flat.

Curved gorges. Five gorges are unusual in that instead of indentations or notches for line attachment, they are curved (Fig. 144). Three of land mammal bone are round in cross section, and two of bird bone are rectangular in cross section. Only one specimen, 60 mm long, is complete. Width and thickness have a narrow range:

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVb	1T1J4-1689x	34+	3	3
IIIc	1T1E9-1444x	60	4	2
IIIc	LT1E10-1459	35+	3	3
IIIc	1T2F12C-2315x	43+	4	2
IIa	1T1D19-2654	47+	3	3

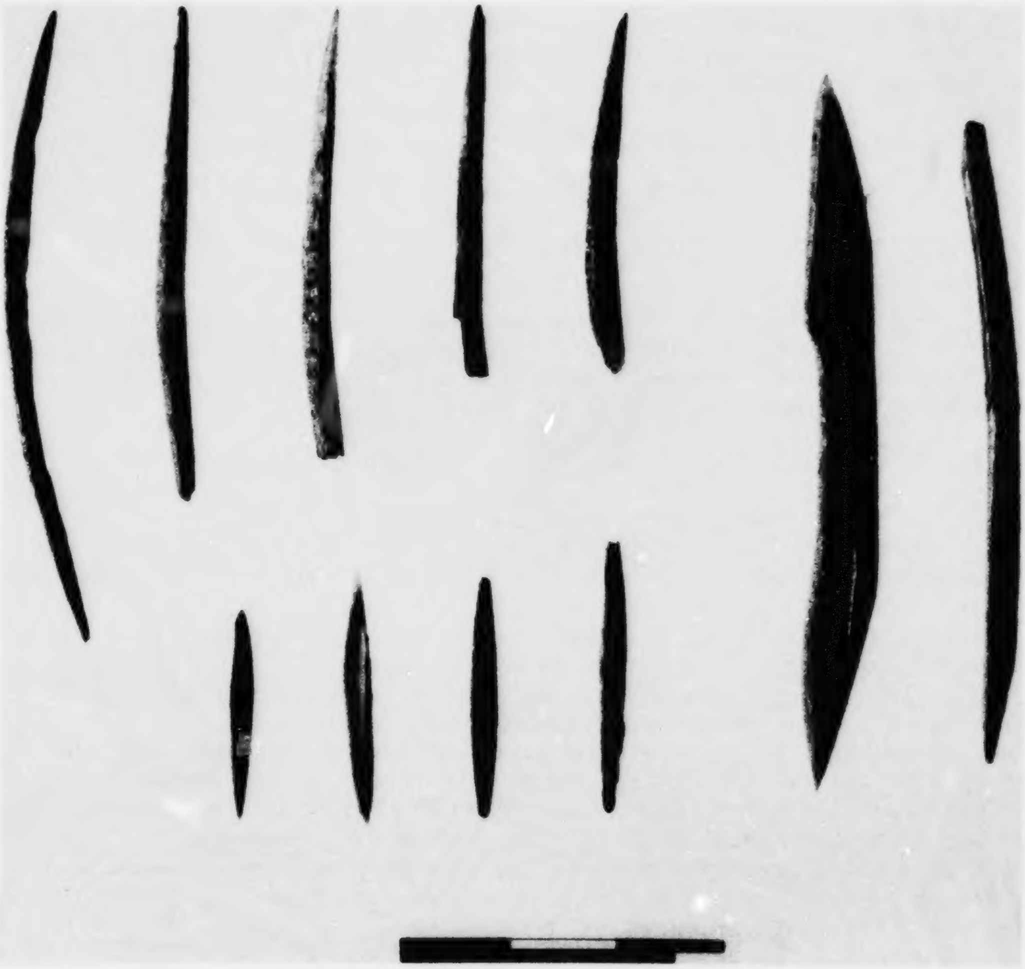


Figure 144. Gorges. Upper left: curved gorges. Far right: miscellaneous gorges. Bottom left: tiny gorges.

Scalene gorges. Eight gorges of land mammal bone and bird bone (Fig. 145; Table 52) resemble a scalene triangle in outline. One complete side is more or less straight and forms the long side of the triangle. The other side of the gorge forms a low apex at one-quarter to one-third of the length of the gorge, thereby making up the two short sides of the triangle. Cross section is rectangular. There are no well-defined indentations or notches for attaching a line. It was probably fastened around or near the apex, which would have had the same effect as the spindle shape on the points of composite fish-hooks. Both ends of the gorges are extremely sharp. Dimensions (Table 52) are summarized as follows:

Table 52. Scalene Gorges: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVd	1T2F3A-1715	28+	3	2
IVb	1T1G6-1818x	32+	4	2
IVb	1T1H6-1410x	48	4	3
IVb	1T2K2B-1546	33+	4	2
IVa	1T3B5-564x	31	3	2
IIIb	1T1J5-1705x	25	3	2
IIIb	1T1J5-1733	52	4	2
IIIb	1T2J7-1528	28+	3	2

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	25-52	39.0	13.04	4
width	3-4	3.5	0.53	8
thickness	2-3	2.13	0.35	8

The scalene gorges occur in the upper levels of Zone IIIb and in Zone IV. These gorges may be useful as an horizon marker.

No scalene gorges were seen in the Nootkan ethnographical collections studied. Some archaeologists have surmised that the scalene-shaped artifacts are arming points of composite fish-hooks, the short side of the artifact being fitted into the point bed of the shank. This interpretation was perhaps inspired by Drucker's diagram of a composite fish-hook (1951: 22, fig. 4). None of the complete sharp-angled composite fish-hooks in the ethnographical collections has bone arming points like the scalene artifacts. The fish-hook arming points are truly sharp at only one end.

Tiny gorges. Four extremely small gorges of split bird bone (Fig. 144) are spindle-shaped in outline and rectanguloid or flat in cross section. Both ends are ground very sharp. Proveniences and dimensions (mm) are as follows:

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVd	1T1G3-1044x	26+	2.5	1.7
IVb	1T1H6A-1414x	25	2.8	1.3
IVa	1T1D7-2026	23	2.5	1.4
IIId	1T1B11-697x	20	2.0	1.3

The distinctly small size sets these gorges well apart from the other variants in the Yuquot sample and suggests a specialized function. The tiny gorges seem confined to the upper levels of Zone III and to Zone IV, which may make them useful as a chronological indicator. A larger sample, however, is required to demonstrate this.

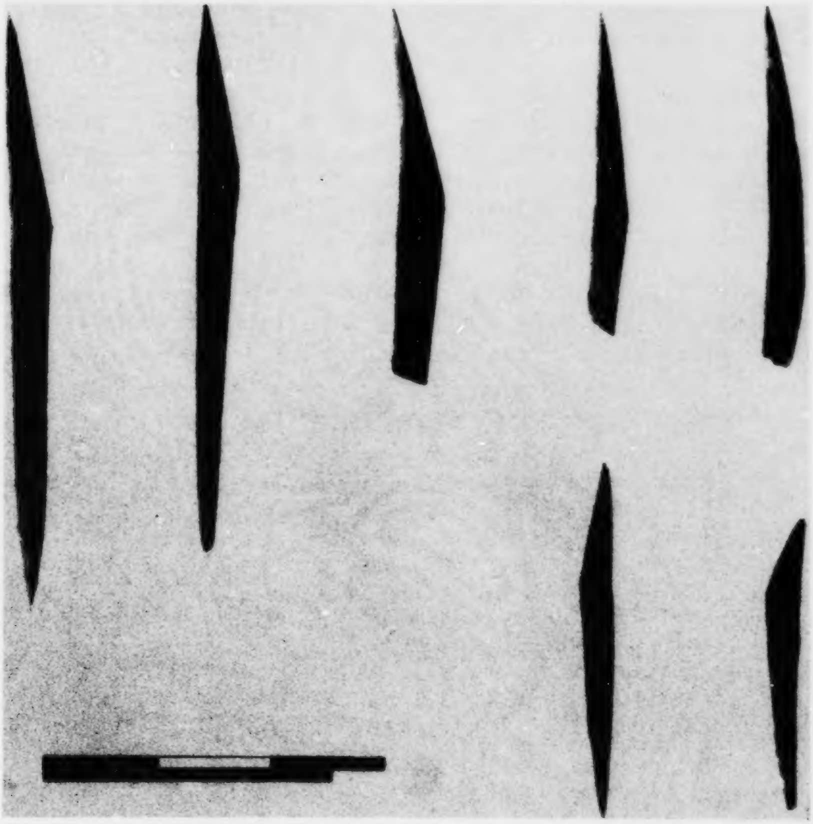


Figure 145. Scalene gorges.

Double-indented rectangular gorges. Four gorges, rectangular in cross section, have opposing side indentations in the middle for line attachment (Fig. 143). One specimen is bird bone; the others are land mammal bone. All four are remarkably similar in dimensions (mm):

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVd	1T2E3-1222	36+	4	3
IVb	1T2K9-2529	32+	4	3
IIIc	1T2E7-1276x	55	3	3
IIIc	1T1G11B-1911	55+	4	3

The two specimens broken at the middle would have had original lengths from 55 to 62 mm.

Miscellaneous gorges. Two gorges do not fit well into the above groups and therefore are described separately here.

An unusually large complete gorge (Fig. 144) was recovered from the middle levels of Zone IIa. The gorge is of split or sectioned land mammal bone. Cross section is rectangular. One side has a long indentation for attachment of a line. Both ends are carefully sharpened. Surfaces are ground smooth and well finished. The gorge is 68 mm long, 7 mm wide and 4 mm thick.

The other gorge, from Zone IVb, is a piece of whole bird bone carefully sharpened at both ends (Fig. 144). The cross section is naturally trianguloid. The gorge has no indentation or notch for line attachment, but the natural slight curvature of the bone may have facilitated this. The gorge is 4 mm wide, 3 mm thick, and was originally slightly longer than 60 mm.

This gorge is from 15 to 30 mm shorter than four very similar complete whole bird bone gorges collected from Kyuquot (BCPM Cat. No. 9467). They measure (mm) as follows:

Length	Width	Thickness
97	4	2.5
91	4	3.0
89	4	3.0
74	4	3.5

Remains of a spruce root line were tied about the middle of each gorge. According to a catalogue note, presumably by their collector, Dr. Newcombe, the gorges were for small fish and sea birds; when used for birds, the gorges were tied to kelp floating. This suggests use in the diving duck trap of baited bone gorges and floating reported by Drucker (1951: 34).

Possible Fishing Sinkers

Nootkan fishing sinkers in ethnographical collections are typically unmodified large egg-like beach stones. Criss-crossed cedar withes were lashed to the stone to provide a means of line attachment. These, in turn, were tied to a fishline of giant kelp or to a spreader, depending on the type of fishing gear. Such sinkers and their use have been described by Drucker (1951: 22-23). There is no definite way of identifying such sinkers archaeologically, unless the cedar withes are preserved. A cache of sinkers with plant fibres disintegrated may perhaps be encountered as a pile of egg-shaped beach stones. Any such sinkers present in the midden were not recognized.

Instead, the midden contains hundreds, likely thousands, of perforated greywacke stones. The "perforations" are portions of piddock burrows made when the greywacke formations were under water. Post-glacial rebound subsequently lifted some formations above sea level. The exposed formations suffered rain, wind, wave and tidal erosion. The Nootkans quarried greywacke and collected pieces separated by erosion for abraders. Thus, large amounts of greywacke containing "perforations" were brought to the midden. The numerous small greywacke stones with "perforations" (Figs. 146, 147) mostly appear to be fragments of unused quarried material or fragments of abraders. Some

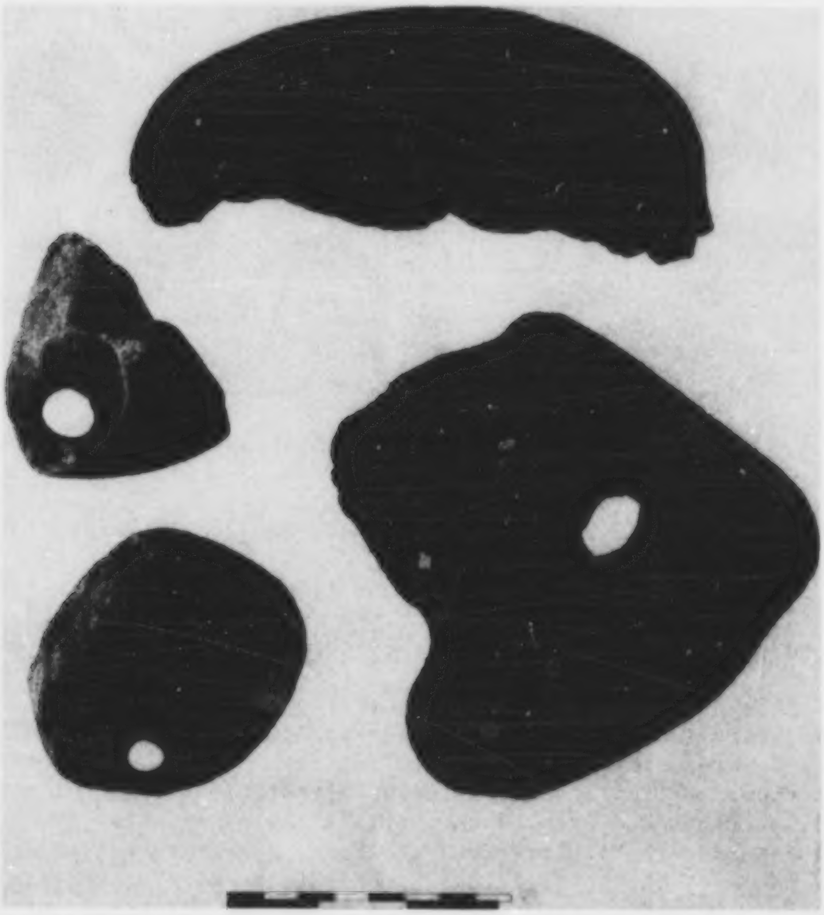


Figure 146. Large "perforated" stones. The specimen on the lower left has been shaped, possibly for use as a sinker (1T2J10-2115).

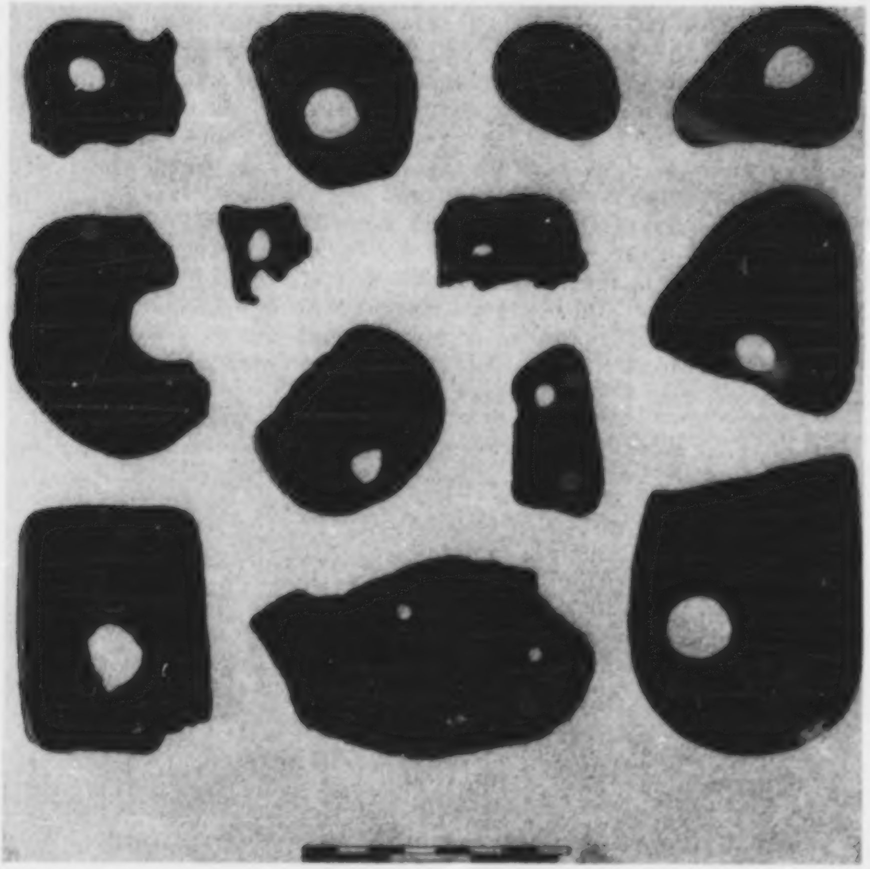


Figure 147. "Perforated" stones.

small "perforated" greywacke stones may have been deliberately collected as well.

At an early stage in the excavation, it was recognized that the small perforated waterworn stones resulted from a natural process. Because the stones were unmodified, they were not collected and an unknown quantity was discarded.

Twenty-seven "perforated" stones of greywacke and mudstone (Figs. 146, 147; Table 53) from all four zones were recovered. They are irregular in shape, waterworn, and contain the remains of at least one piddock burrow. Broken and uncompleted "perforations" are not uncommon. The burrow portions are usually asymmetrical: wide and oval at one end, small and round at the other. Several stones appear to be fragments of abraders. None of the perforations appears to be worn or modified artificially. Assuming that the perforated stones were used for fishing sinkers, shape (which is extremely irregular) would not be a significant attribute. Instead, minimum perforation dimensions for line attachment and weight (Table 53) would probably be most important. Future excavations, especially in waterlogged middens, may reveal perforated stones and other possible sinkers in a functionally identifiable context.

Table 53. "Perforated" Stones: Proveniences and Measurements

Zone/Stratum	Artifact No.	Minimum Size of "Perforation" (mm)	Wt (g)
IVa	1T3A3-130	14 x 12	58.6
IVa	1T1D6-3652x	20 x 19	154.9
IVa	1T1D8-3667x	13 x 13	97.9
IIId	1T1A5B-272	16 x -*	705.3
IIIc	1T1A11-418	12 x 9	34.2
IIIc	1T1A11-419	17 x 16	52.4
IIIc	1T3A9-286x	11 x 11	38.5
IIIc	1T1B17-792	12 x -*	82.0
IIIc	1T2B15-893	6 x 6	59.4
IIIc	1T1D12-5418x	11 x 11	7.3
IIIc	1T1E6-3723x	8 x 6	14.5
IIIb	1T2M6-1730x	4 x 4	9.1
IIIb	1T2G10-1529	6 x -*	8.9
IIa	1T2A16-820x	6 x 5	29.7
IIa	1T1B26-1169	23 x -*	64.8
IIa	1T2B20-3705x	15 x 15	62.5
IIa	1T1E17-3669x	16 x 16	181.5
IIa	1T1E21-5086x	18 x 18	133.1
IIa	1T2E19-3651x	14 x 13	101.6
IIa	1T1F14C-4287x	16 x -*	100.3
IIa	1T2F18-2349	23 x 16	115.0
IIa	1T2H11-3668x	9 x 8	23.0
IIa	1T1J21B-3722x	22 x 20	708.7
IIa	1T2J10-2115	11 x 10	339.7
Ib	1T2C27-1195x	5 x 5 5 x 5	111.3
no provenience	1T1X1-3197	18 x 17	53.3
	1T1X1-3611	14 x 11	95.3

* No data.

Fishing with Harpoons, Leisters and Other Devices

After fishing with hooks and lines, the most important group of food procurement practices indicated by the archaeological record is fishing with harpoons and leisters. At least 318 artifacts are believed to reflect these practices with the following zonal distribution: Zone I, 6; Zone II, 118; Zone III, 97; Zone IV, 46; without provenience, 51. The most significant procurement device, and also the one most constant through time, is the toggling harpoon head for salmon. The archaeological record indicates an evolution through three types into the historic period. Evidence of leisters, however, is considerably less definite. Only 21 artifacts may represent leisters, and unlike the distinctly shaped composite toggle heads, none of the 21 artifacts could be definitely identified as parts of leisters. Other possible, but unidentified, leister side points may be among the 58 miscellaneous points not included in the total of 318.

Finally, several artifacts that may have related to fishing are discussed. Two artifacts suggest line toggles of harpoons or other fishing gear. A distinctive bone point may be the tine of a herring rake. A crude whalebone club, perhaps used for killing fish, is also described.

Harpoon Foreshafts

Twelve whalebone artifacts (Figs. 148-152; Table 54) from Zones I, II and III are likely fragments of harpoon foreshafts. All are long, slender tapering points whose sides form angles of 15° or less. Cross sections are rectanguloid or round. All surfaces are ground smooth and often polished. Only six artifacts retain distal ends, which are blunt, rounded points. Two of these (Figs. 150, 152c) show some wear and compactness on surfaces around the tip. Only one artifact (Fig. 152d) may retain a proximal end. This is difficult to determine because the edges seem waterworn. One face has been cut nearly halfway through at 12 mm from the end and then ground obliquely to the end. This perhaps

Table 54. Harpoon Foreshafts: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Maximum Width	Maximum Thickness	Fig. No.
IIId	1T3A8-249	90	12	8	152d
IIIc	1T3A9-271	131	18	10	
IIIc	1T3A10-287	97+	16+	9+	152e
IIIb	1T2H78-1874	84+	20+	13+	152f
IIIb	1T2K8-2515	50+	17+	8	152b
IIa	1T1A25A-1574	117+	21+	14+	
IIa	1T1A25A-1581	183+	13+	13+	152a
IIa	1T1H14A-5373x	frag.	10+	9+	
IIa	1T2H158-3438x	frag.	14+	13+	
Ib	1T1A30-3839x	frag.	18+	17+	152g
no provenience	1T1X1-738	82+	20+	11	152c
	1T1X1-3205	120+	16	14	

served as a joining surface for another section of the artifact. The artifacts are too fragmentary for a meaningful summary of dimensions. These are given in Table 54.

No whalebone points like these artifacts were seen in the ethnographical collections studied. The whalebone points, however, strongly resemble the fixed wooden foreshaft arms of salmon and sealing harpoons. The points also resemble the elk antler heads of short spears for halibut (cf. NMM VII-F-212, VII-F-214; AMNH 16/2025, 16/2026, 16/2027), but do not seem sharp enough or strong enough for that purpose.

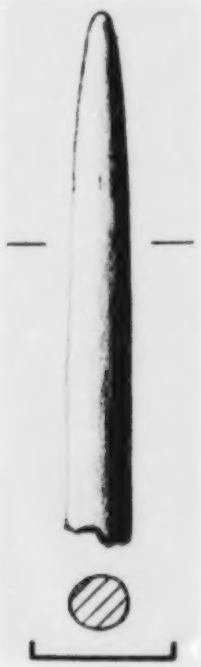


Figure 148. Tip of harpoon foreshaft (1T1A-2667). Whalebone. (Scale for Figs. 148-151: 0-2 cm.)

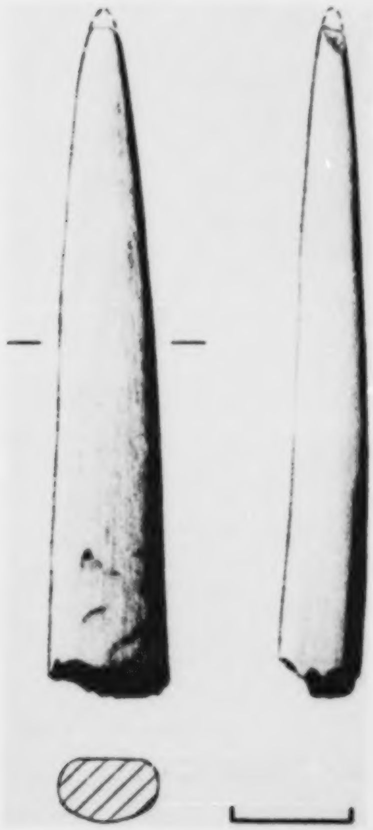


Figure 149. Tip of harpoon foreshaft (1T1A25A-1574). Whalebone.

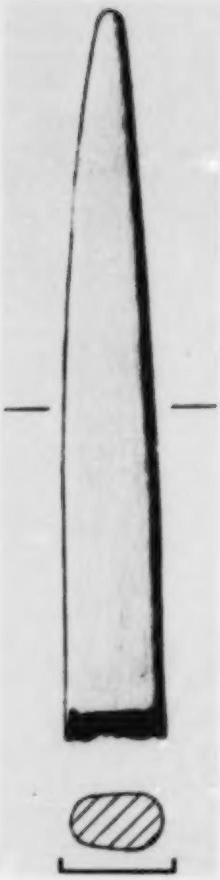


Figure 150. Tip of harpoon foreshaft (1T3A9-271). Whalebone.

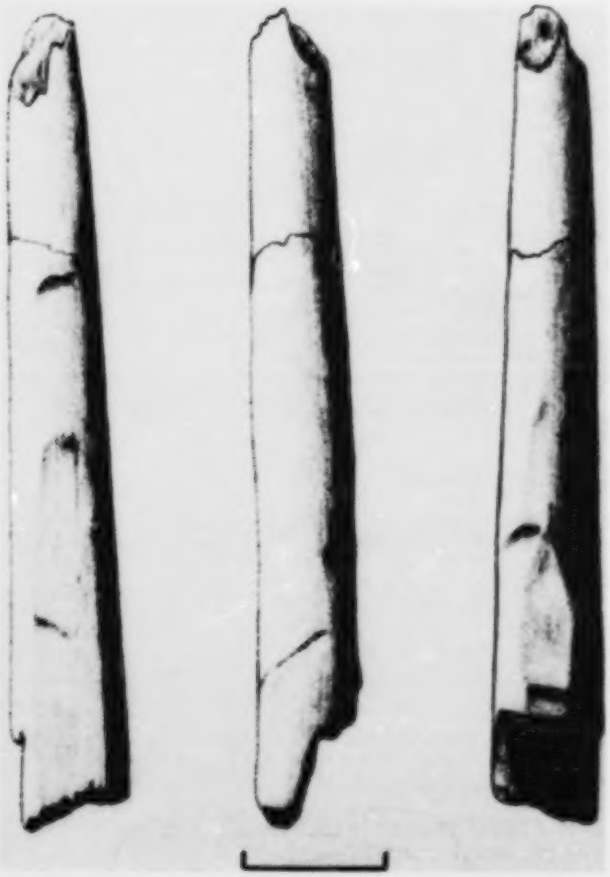


Figure 151. Fragmentary harpoon foreshaft (1T1X1-3205). Whalebone.

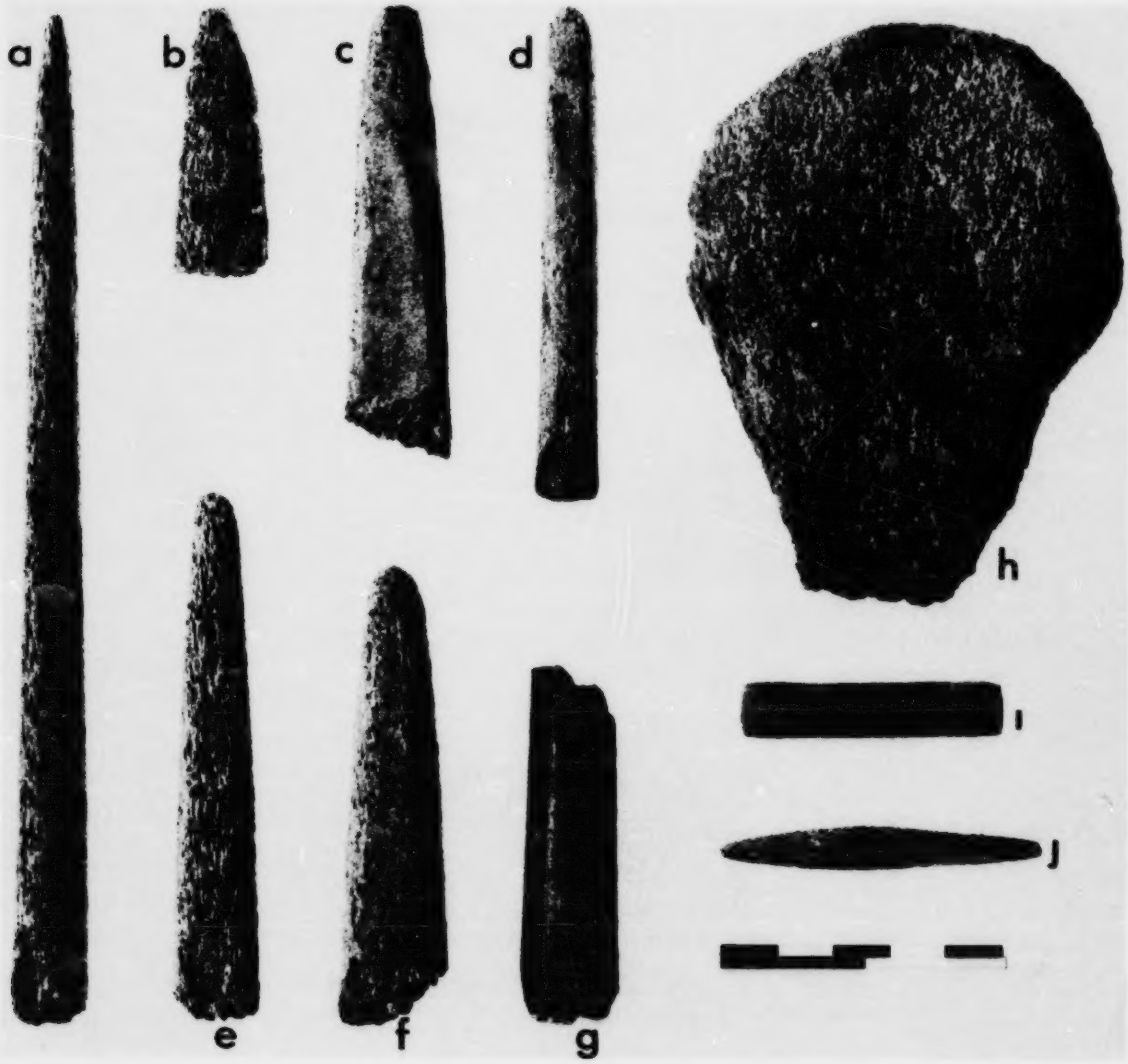


Figure 152. Harpoon foreshaft and related devices. Fragments of harpoon foreshafts: a, 1T1A25A-1581; b, 1T2K8-2515; c, 1T1X1-738x; d, 1T3A8-249; e, 1T3A10-287; f, 1T2H7B-1874; g, 1T1A30-3839x. Possible uncompleted finger grip: h, 1T2E7-2988x. Probable toggles: i, 1T1H20-2754; j, 1T3B11-755x. (Scale: cm, in.)

Toggling Harpoon Heads for Salmon

After fishing with composite hooks, the next most common food procurement device indicated by the archaeological record is toggling harpoon heads for salmon. At least 274 artifacts belonging to salmon harpoon heads were recovered. Several less apparent specimens which could not be included here with reasonable certainty may be among the miscellaneous points. The number 274 does not include associated or related artifacts such as foreshafts and toggles.

Three basic classes of toggling harpoon heads for salmon are apparent. They reflect an evolution of this artifact. Identification of prehistoric classes are salmon harpoon heads is inferred from their similarity of the tripartite type known ethnographically (Drucker 1951: fig. 3; 1965: 12).

The earliest class, found in Zones I - III, is termed "self-armed valves." In several instances, "valve" may be a misnomer, because the artifacts may have been used as single-piece toggle heads, the lashings of the retrieving line forming a socket for the foreshaft. The shape of the self-armed valves is not as well standardized as in the other classes. Probably associated with the self-armed valves are ancillary valves, which are also poorly standardized regarding shape, but are clearly not self-armed. They likely functioned with a self-armed valve, or with another ancillary valve and separate arming point (Fig. 153).

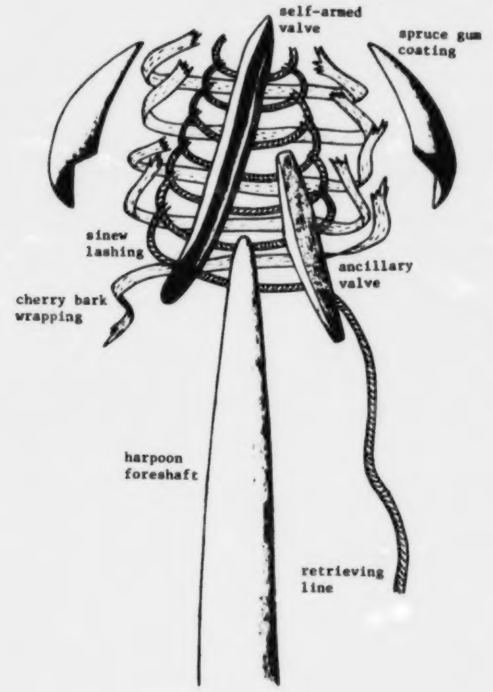


Figure 153. Exploded view of hypothetical composite salmon harpoon head formed of self-armed valve and ancillary valve.

Simple valves of composite toggle heads are found in Zones II and III. Matched simple valves were armed with wedge-based points (Fig. 154). A variant arming point may be the short wide points with flat bases, which were perhaps used with a slotted simple valve.

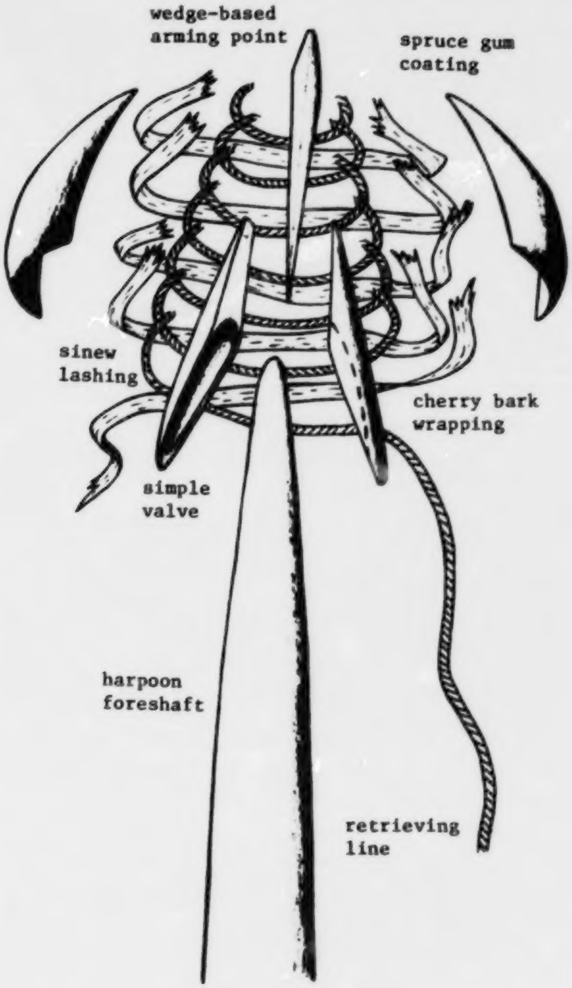

wedge-based arming point
spruce gum coating
sinew lashing
cherry bark wrapping
simple valve
harpoon foreshaft
retrieving line

Figure 154. Exploded view of composite salmon harpoon head formed of simple valves and wedge-based arming point. Construct is based on Mitchell 1968: fig. 7t.

The ethnographically known composite toggle head for salmon occurs in Zones III and IV. These heads consisted of matched channelled valves armed with biconical points (Fig. 155).

A fourth class of salmon harpoon head is suggested by one specimen which appears to be a single-piece togglehead based on an antler tine.

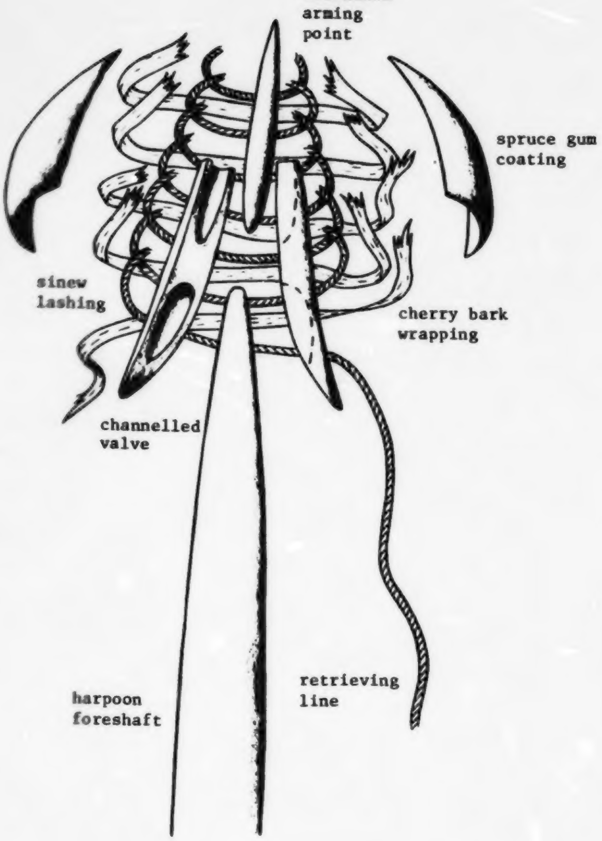

biconical
arming
point
spruce gum
coating
sinew
lashing
cherry bark
wrapping
channelled
valve
retrieving
line
harpoon
foreshaft

Figure 155. Exploded view of composite salmon harpoon head formed of channelled valves and biconical arming point.

Self-armed valves. Forty-eight points of antler and bone (Figs. 153, 156-171; Table 55) are believed to be either self-armed valves of composite toggle heads or self-armed one-piece toggle heads. They were found in the upper levels of Zone Ib, and in Zones II and III. Although the artifacts appear irregular in shape, they have several basic attributes in common.

Most distal ends are a blunt point, with sides forming angles of 15 to 50° (Figs. 156-171). Several distal tips are broken or blunted, perhaps from impact as a projectile.

All the artifacts have a flattened ventral face, usually ground on the cancellous tissue. Two specimens, however, are ground flat on the cortex (Figs. 159, 161). On points where no marrow channel remains, the ventral face is simply ground flat, but where a marrow channel or cavity remains, the projecting surfaces near the lateral edges are ground flat (Figs. 166-168). The flattened ventral surface usually begins about 15 to 20 mm from the distal tip. The ventral face may occupy from two-thirds to six-sevenths of the artifact length, until the ventral face turns upward near the proximal end. The flattened ventral face, as on channelled and slotted valves, may have served as a contact surface for an ancillary valve.

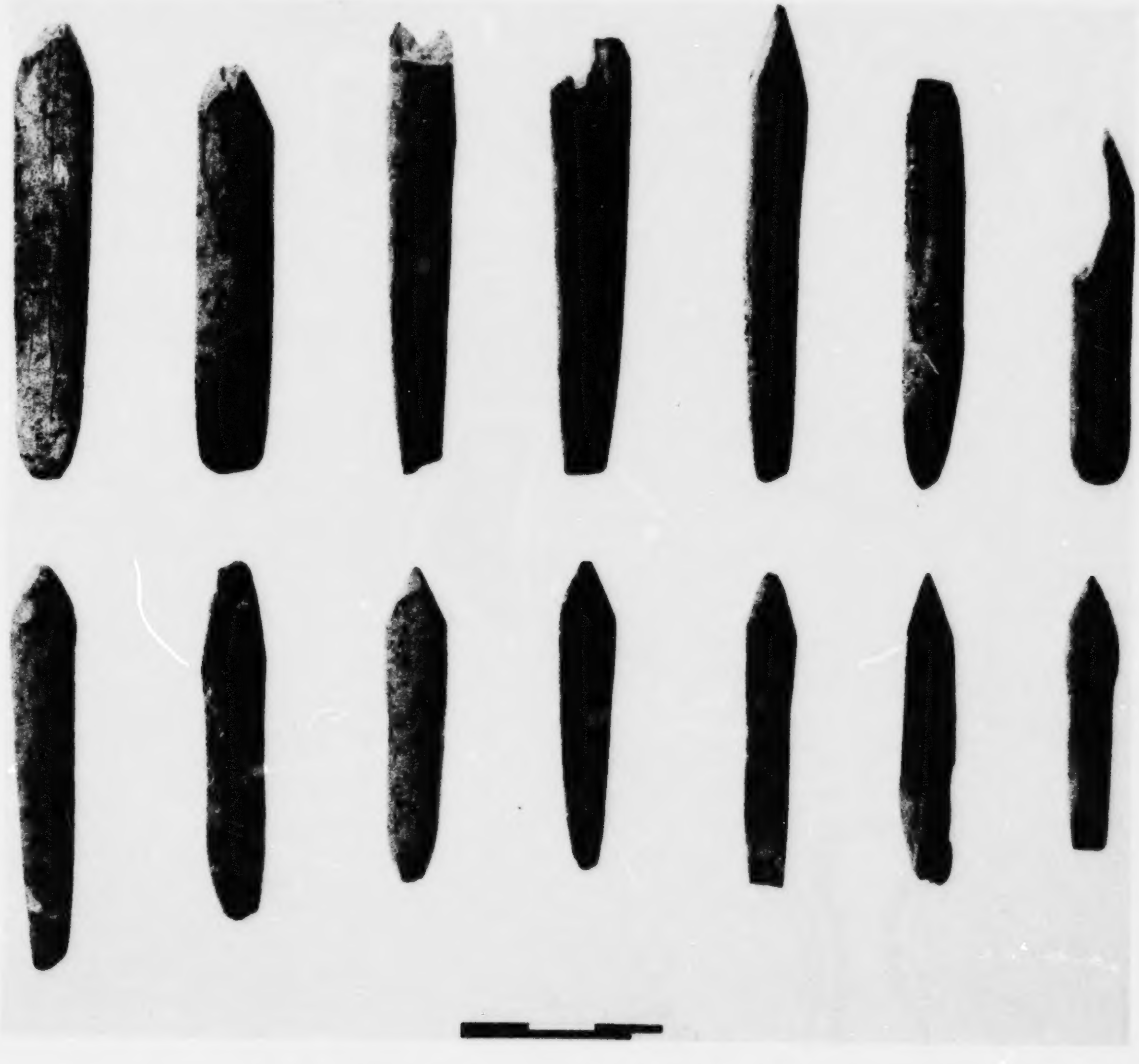


Figure 156. Self-armed valves, dorsal faces.

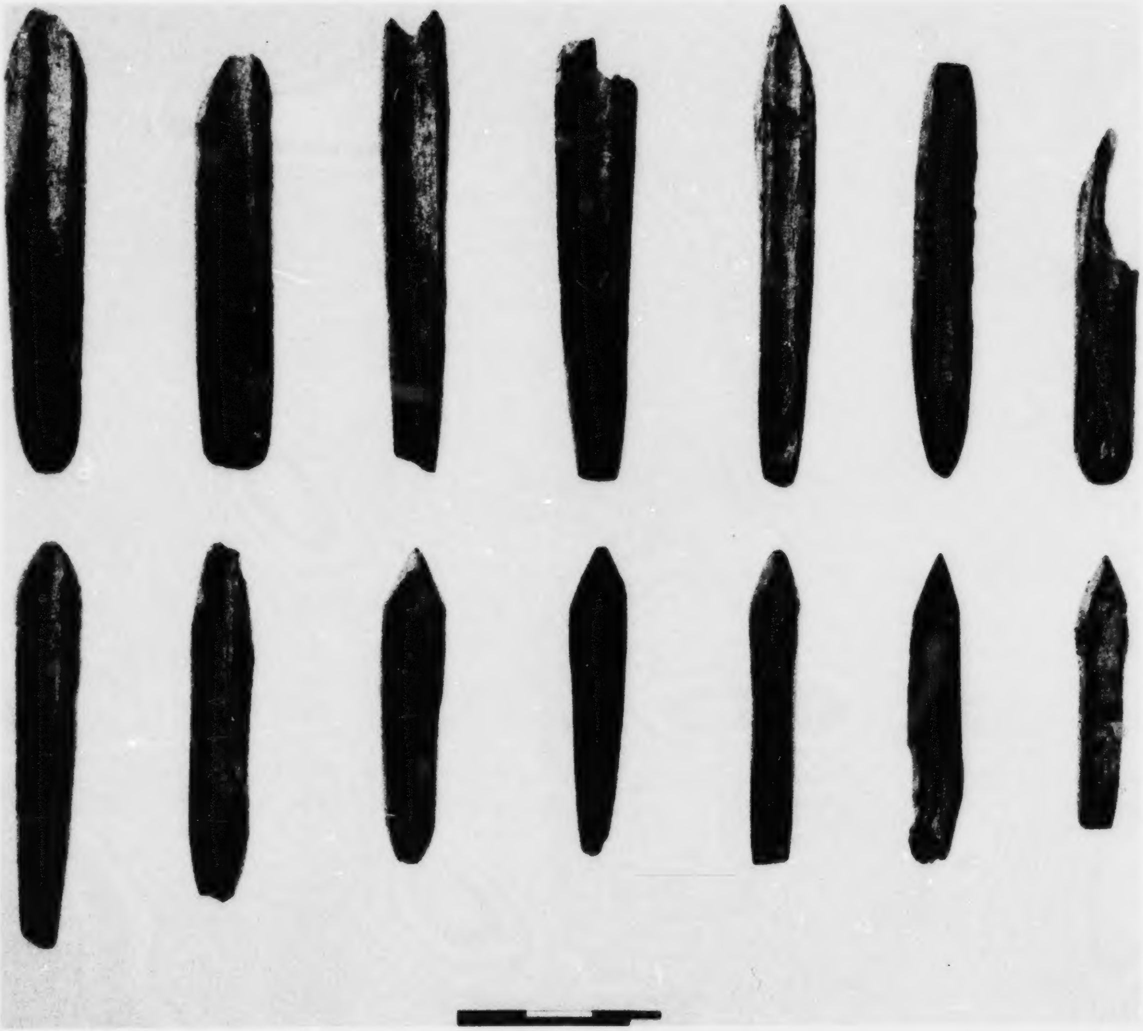


Figure 157. Self-armed valves, ventral faces.

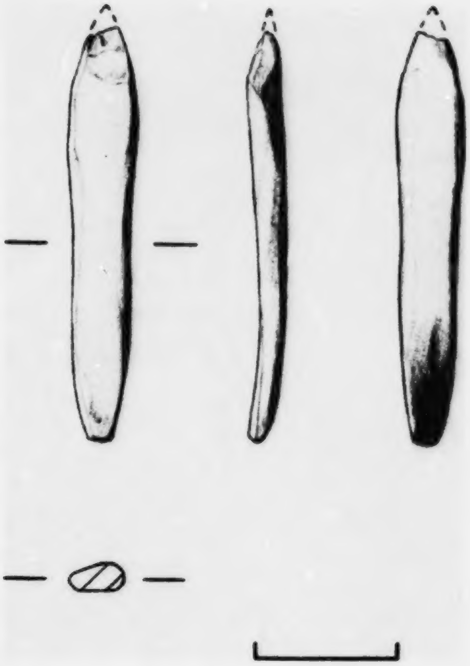


Figure 158. Self-armed valve from Zone IIa (1T2A22-2737x). (Scale for Figs. 158-171: 0-2 cm.)

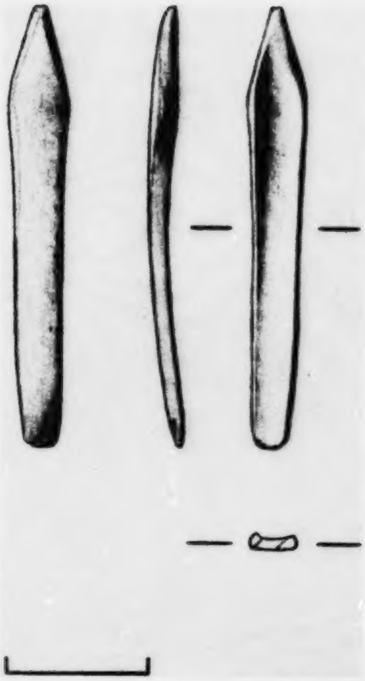


Figure 159. Self-armed valve from Zone IIa (1T2A25-1196).

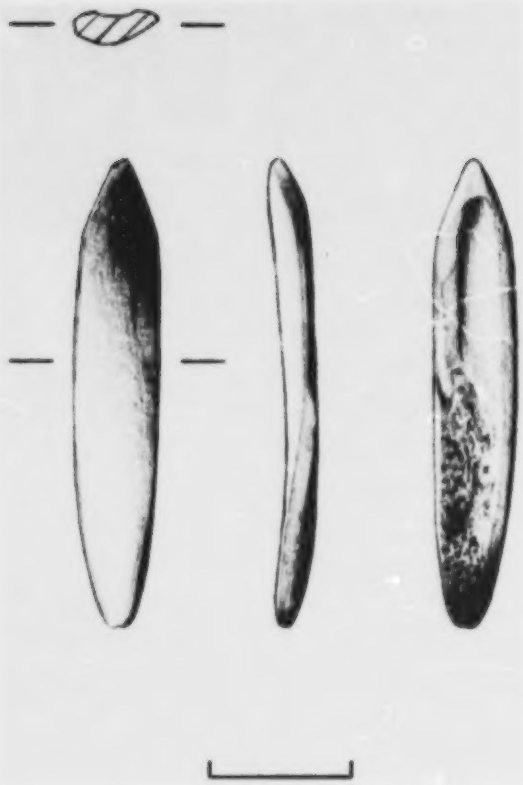


Figure 160. Self-armed valve from Zone IIa (1T2B23-1071).

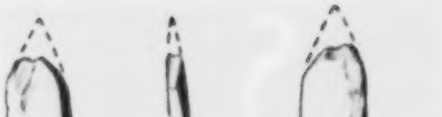


Figure 161. Self-armed valve from Zone IIb (1T2H19A-2422).

None of the artifacts has a defined foreshaft socket. The remaining large marrow channels on several artifacts could have served as a foreshaft socket. The shallow remains of a channel may have accommodated part of the foreshaft. The wrappings could also have formed a foreshaft socket. This will be discussed later.

Cross sections include a wide range of shapes: plano-convex (Figs. 160, 166), rectanguloid (Figs. 159, 161), trianguloid (Figs. 165, 167) and aysmmetrical - but all have a flattened ventral face. The variation in cross-section shape is largely due to the natural curvature of the particular piece of antler or bone utilized. The curved cortex, usually unmodified or little altered, is selected for the dorsal surface. The lateral edges are ground slightly convex.

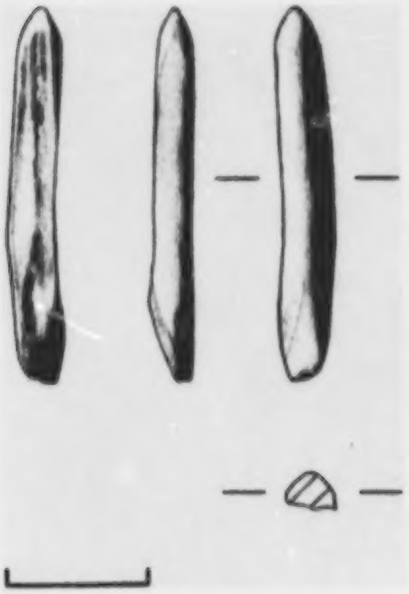


Figure 162. Self-armed valve from Zone IIa (1T1J16-2461).

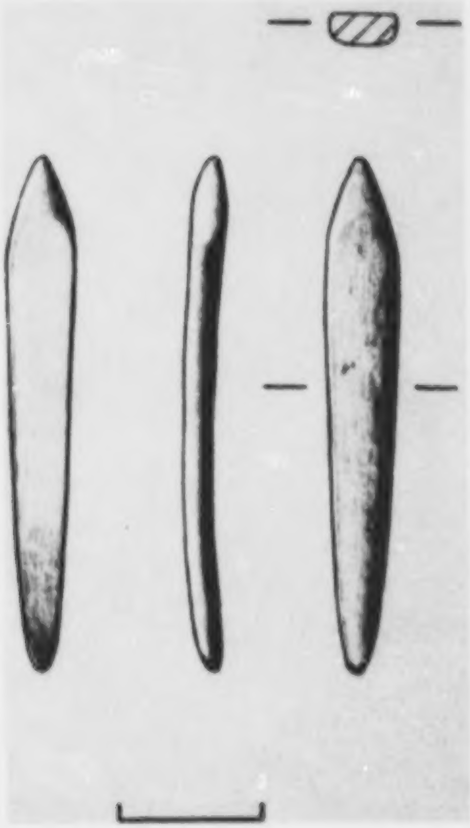


Figure 163. Self-armed valve from Zone IIa (1T2F19-2286).

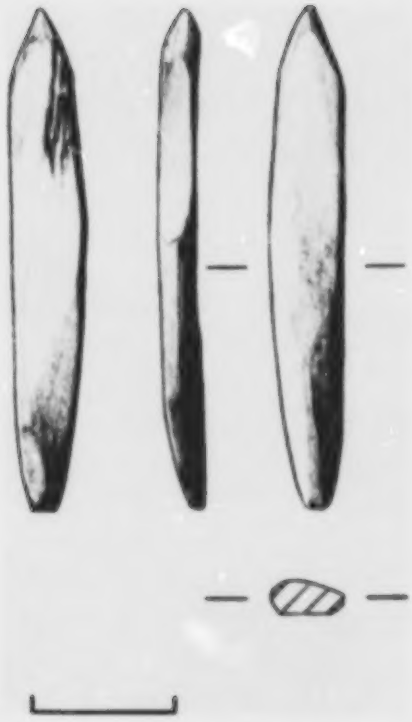


Figure 164. Self-armed valve from Zone IIa (1T2N6B-1989).

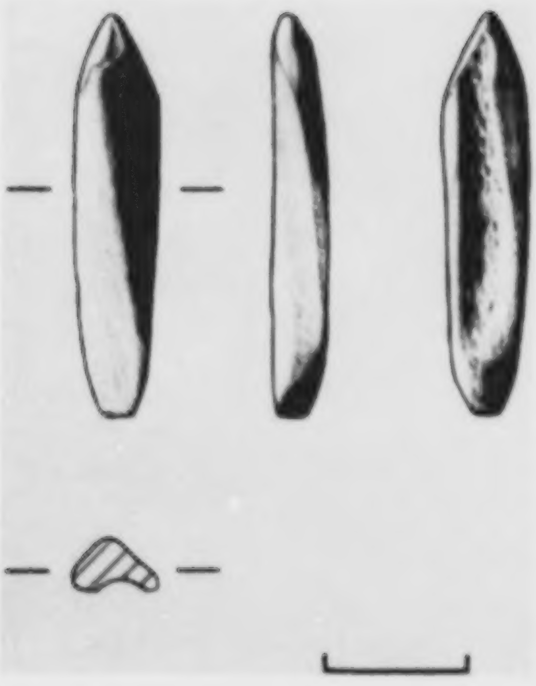


Figure 165. Self-armed valve from Zone IIa (1T1H14A-2056).

The proximal ends vary considerably, but all are upturned on the ventral face. The lateral edges taper to a rounded or squared off tip. Most dorsal faces are also upturned at the proximal end; however, relatively flat dorsal surfaces are not unusual. The proximal ends resemble the spurs or barbs of composite toggle heads.

Distinctive attributes such as lashing grooves, ridges or side notches to facilitate attachment of an ancillary valve to the probable contact surface are absent. Other attributes, however, probably served this function. Seven specimens (Figs. 156, 158, 159) are slightly waisted on the lateral edges. One artifact has a depression abraded into the middle of the dorsal face. A few specimens have a slightly raised surface or hump on the proximal one-third of the doral surface (Figs. 168, 171). The dorsal and lateral surfaces of some specimens have traces of reddish-brown stain, which may have come from plant fibre lashings. Such stains, however, are poorly defined here, and cannot be said to form a pattern as in the case of other Yuquot artifacts.

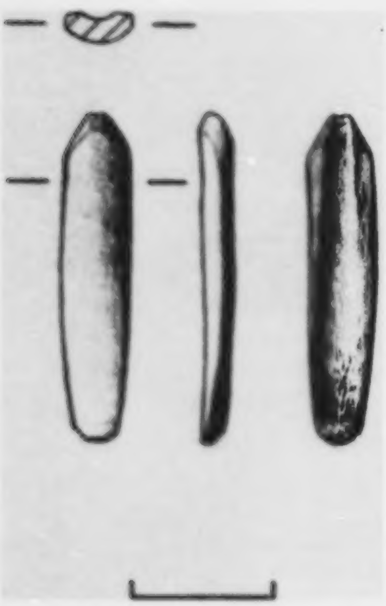


Figure 166. Self-armed valve from Zone IIa (1T2J13-2161).

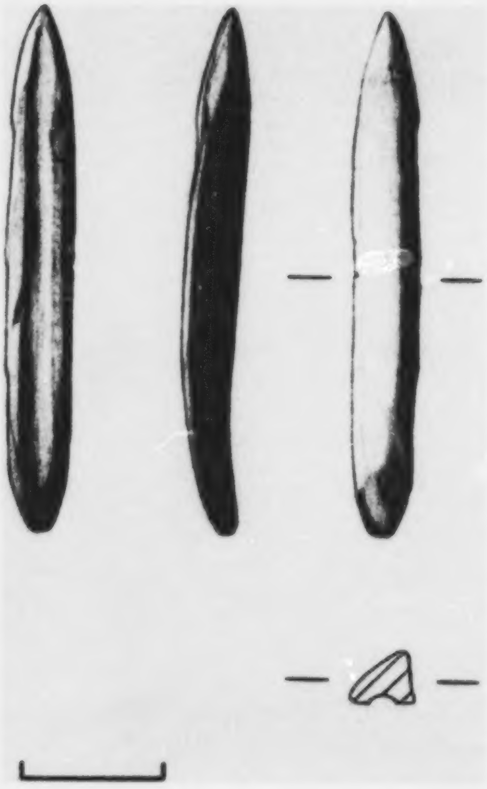


Figure 167. Self-armed valve from Zone IIIc (1T3A13A-882).

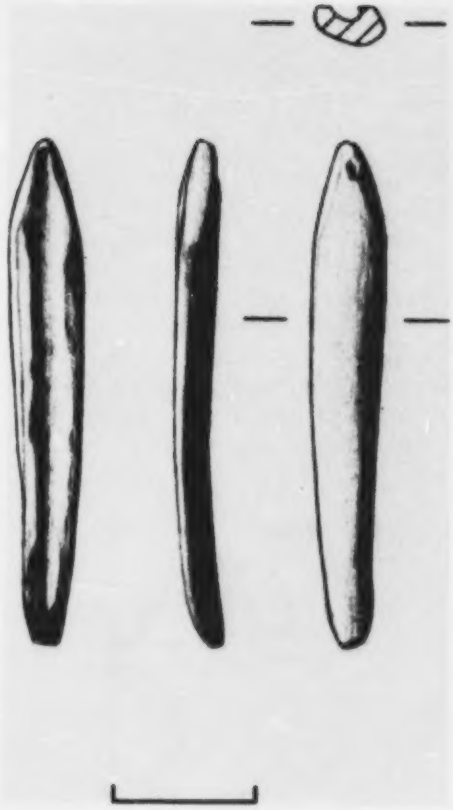


Figure 168. Self-armed valve from Zone IIId (1T2A8-622x).

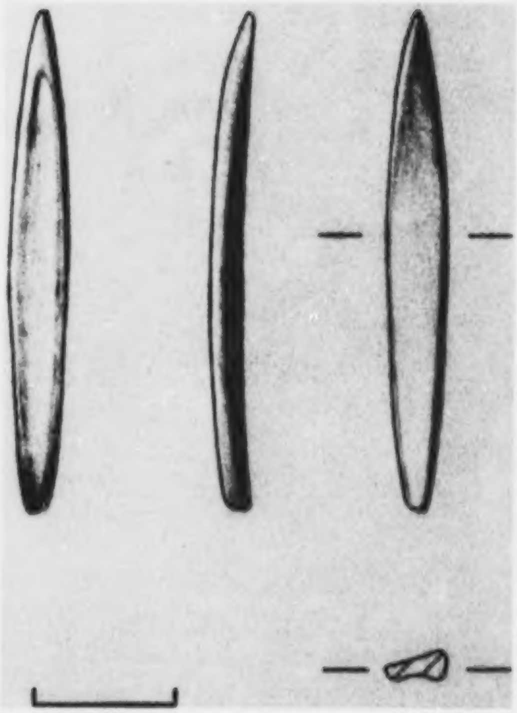


Figure 169. Self-armed valve from Zone IIIc (1T1E11-1509).

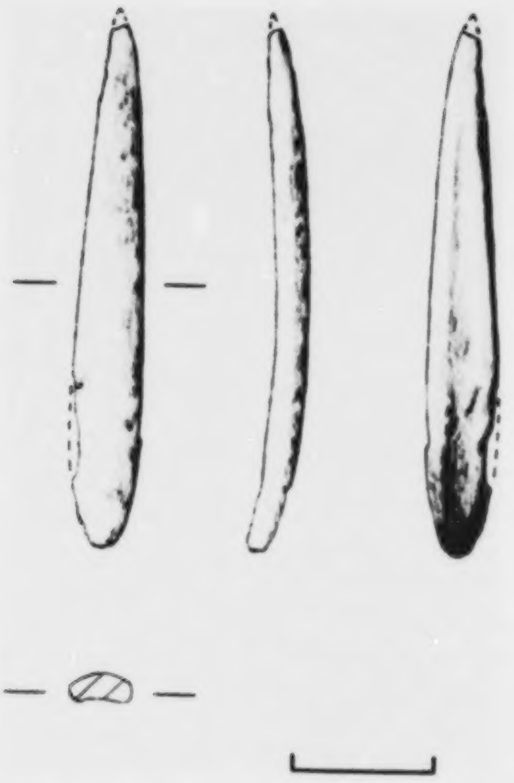


Figure 170. Self-armed valve from Zone IIIc (1T1E8-1417).

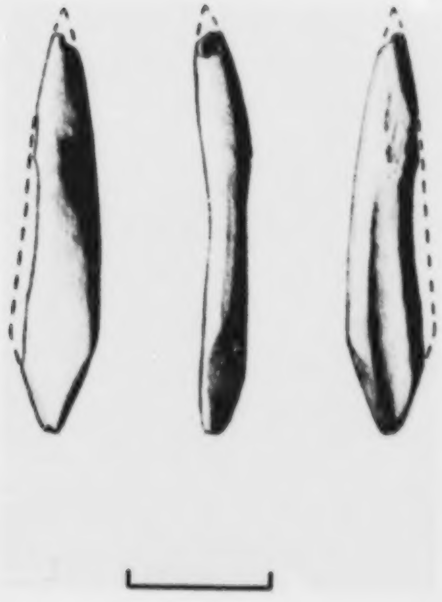


Figure 171. Self-armed valve from Zone IIId (1T3A7-2743x).

The self-armed valves vary considerably in size (Table 55). Size clusters are not readily apparent. The lengths form more or less a curve or a continuum, while widths and thicknesses remain relatively constant.

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	42-97	62.96	14.31	24
width	7-13	10.16	1.49	43
thickness	3-8	5.38	1.06	48

Table 55. Self-Armed Valves: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Fig. No.
IIId	1T2A8-622x	75	11	6	168
IIId	1T3A7-2743x	59+	11	6	171
IIId	1T1C8-348	55+	10	6	
IIIc	1T3A15A-882	78	10	7	167
IIIc	1T2D8-2238	48	8	6	
IIIc	1T2D9-2248	56+	10+	6	
IIIc	1T1E8-1417	78	10	5	170
IIIc	1T1E11-1509	74	9	4	169
IIIc	1T1F10-1288	62+	10	5	
IIIc	1T1F11-1970	62+	9	5	
IIa	1T1A24-1562	61+	12	5	
IIa	1T1A24-1568	66+	13+	5	
IIa	1T2A20-5453	62+	12	6	
IIa	1T2A22-2737x	61+	10	5	158
IIa	1T2A25-1196	65	9	4	159
IIa	1T3A18A-920	frag.	13	6	
IIa	1T3A18-3756x	frag.	10	7	
IIa	1T2B23-1071	69	12	5	160
IIa	1T2C23-1176	47	9	4	
IIa	1T3C26-1081	57+	10	5	
IIa	1T2F19-2286	76	11	5	163
IIa	1T1G16-2262	47	8	5	
IIa	1T1G16-2268	57	11	7	
IIa	1T1H14A-2056	60	12	8	165
IIa	1T1H17-2151	49	11+	6	
IIa	1T2H13D-3791x	70+	13	5	
IIa	1T1J14-2431	73	10	5	
IIa	1T1J14-2433	53+	8+	5	
IIa	1T1J15-2438	60+	9	6	
IIa	1T1J16-2461x	56	7	6	162
IIa	1T2J13-2161	49	10	5	166
IIa	1T2J19C-2772	53+	12	5	
IIa	1T1K10A-2133	54+	10+	6	
IIa	1T1L11A-3524x	59+	9	5	
IIa	1T2N6A-1987x	53	9	4	
IIa	1T2N6B-1989	74	12	6	164
IIb	1T2H12B-3433x	69+	11	6	
IIb	1T2H19A-2422	70+	10	3	161
IIb	1T1L14C-2606	78	9	7	
Ib	1T3A28B-2254	frag.	12	7	
no provenience	1T1X1-3022	68+	11	7	
	1T1X1-3037	68	10	3	
	1T1X1-3097	53+	12	5*	
	1T1X1-3098	61+	9	5	
	1T1X1-3102	48	10	5	
	1T1X1-3107	97	7	4	
	1T1X1-3119	50	10	4	
	1T1X1-3249	42	8	5	

* Uncompleted.

The broken or blunted distal ends, flat ventral faces, waisted sides and proximal spurs together suggest self-armed valves. Although ancillary valves are known to have been used by Nootkans, none of the artifacts was found in context with another valve. Such a valve may have been added, as suggested in a hypothetical construct (Fig. 153). Possibly a smaller, but similar valve was attached to the ventral face, as in the Tlingit salmon harpoon head figured by Niblack (1970: fig. 137e). It is also possible that the self-armed "valves" functioned as single-piece toggle heads, with the wrapping of the retrieving line forming a socket for the foreshaft, similar to the Haida salmon toggle head figured by Niblack (1970: Fig. 137a).

The similarity of the self-armed valves, in particular the blunt arming point, flat ventral area and proximal spur, to the composite heads for salmon (Figs. 154, 155) suggests a toggle head for salmon.

Ancillary valves. Seventeen antler and bone artifacts (Figs. 172-180; Table 56) from all four zones are believed to have been

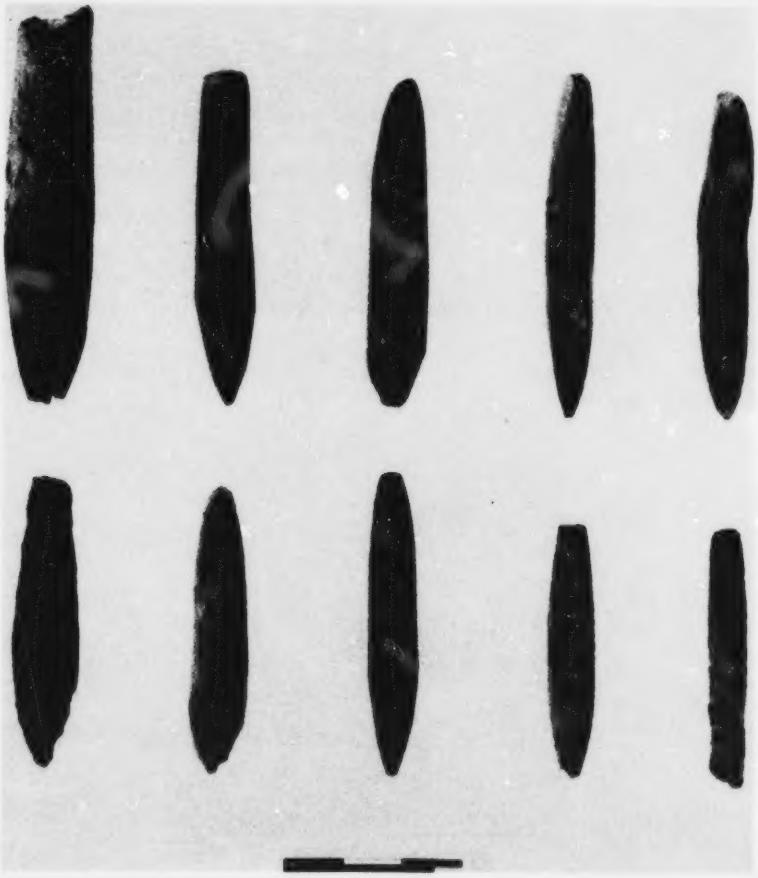


Figure 172. Ancillary valves, dorsal faces. (Scale: cm, in.)

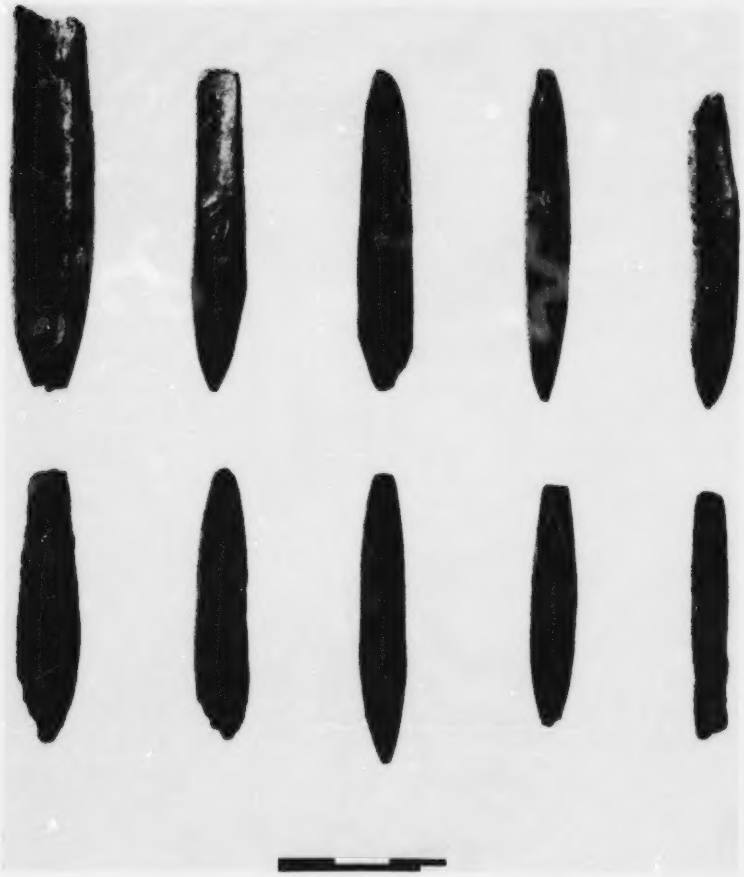


Figure 173. Ancillary valves, ventral faces. (Scale: cm, in.)

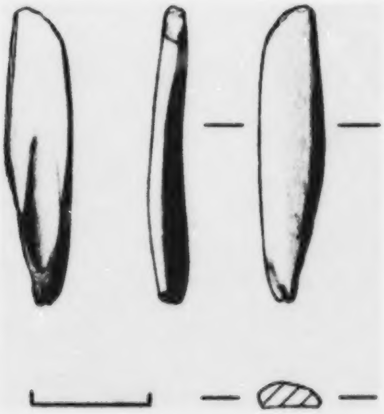


Figure 174. Ancillary valve or broken self-armed valve from Zone IIa (1T1J19C-2722). (Scale for Figs. 174-180: 0-2 cm.)

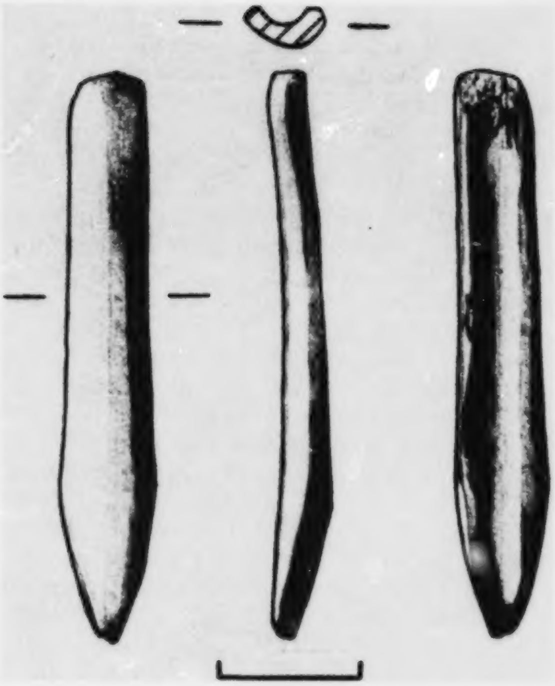


Figure 175. Ancillary valve from Zone IIa (1T1F18-2186x).

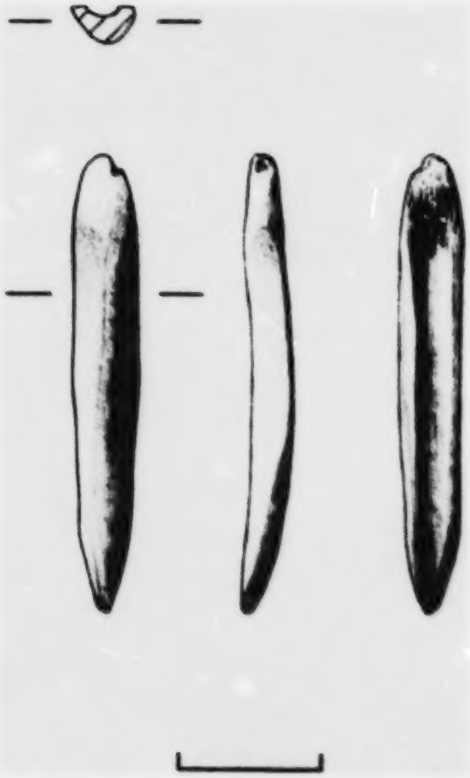


Figure 176. Ancillary valve from Zone IIb (1T1J11-2379).

mostly ancillary valves for self-armed valves. A few artifacts may have been mates for similar valves, which were armed with a separate point.

In contrast to the regularly carved simple valves and channelled valves, the ancillary valves vary considerably in shape, but have common basic attributes. The distal ends are either rounded or squared off, sometimes asymmetrically. The distal dorsal surface on several specimens is ground obliquely at the end. The distal one-half to two-thirds of the ventral face is ground flat. Recessed cancellous tissue and deep marrow cavities have sometimes escaped flattening, but all projecting surfaces and the cortex areas along the lateral edges are ground flat. This flattened surface may have served as a contact surface against which another valve was lashed. The dorsal surface is usually slightly convex across, but sometimes almost flat. The lateral edges are ground slightly convex or flat. Cross section is either plano-convex or rectanguloid, apart from the concave marrow cavity. The proximal portion of the valve begins at the widest and thickest dimensions. The lateral edges taper to a blunt spur, slightly upturned on the dorsal and ventral faces. There is no well-defined groove for a foreshaft socket on the ventral face of the spur, but presumably the unmodified marrow cavities facilitated insertion of the foreshaft. A few artifacts have attributes that might have assisted attachment with lashings. Slight waisting occurs on some specimens (Figs. 175, 176, 177) and dorsal depressions on others (Figs. 174, 176, 180). A large valve is ground flat across the dorsal face opposite the ground flat ventral face (Fig. 175).

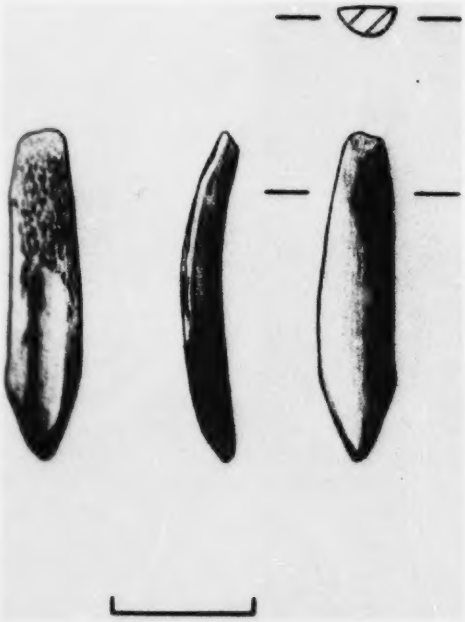


Figure 177. Ancillary valve from Zone IIa (1T2G15-2017).

Table 56. Ancillary Valves: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVb or d	1T1F4-3346x	50	12	4
IVa	1T1C5-2866x	49	10	4
IIIc	1T1B13-753	73+	14	5
IIIc	1T1E7-3790x	53	11	6
IIIc	1T2E12-1297	63	8	5
IIa	1T2B22-1067	74	11	6
IIa	1T1F18-2186	84	13	7
IIa	1T2G15-2071	49	11	5
IIa	1T2G17B-2127	57+	10	5
IIa	1T1K13-2195	58	11	3
IIb	1T1J11-2379	68	9	6
IIb	1T1L14C-2607x	52	9	5
IIb	1T2L12-2158	68+	16	7
Ib	1T1E27B-2506	44+	7	4
no provenience	1T1X1-3011	59	9	6
	1T1X1-3030	57	9	5
	1T1X1-3051	43	8	5

Artifact dimensions (Table 56) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	43-84	58.38	11.43	13
width	7-16	10.47	2.32	17
thickness	3-7	5.18	1.07	17

The four largest valves deserve special mention. They are proportionately longer and more carefully made than the other ancillary valves. One is waisted laterally (Fig. 178); another is ground on the dorsal surface near the distal end (Fig. 179) to facilitate lashing. The largest valve (Fig. 173) may originally have been a self-armed valve or a large valve with separate arming point for sea mammal hunting. The long proportions, long ventral contact surfaces and raised distal ends are reminiscent of the slotted valves which appear late in the Yuquot cultural sequence. Perhaps these four valves are early types of slotted valves; however, there is no apparent provision for a cutting blade.

None of the ancillary valves was found in context with one another or with a self-armed valve. The ancillary valves may have served as small valves lashed to various female composite toggle head arrangements, possibly: self-armed valves, a matched valve and separate arming point, or even unilaterally barbed points with a foreshaft socket and spur. An example of the last mentioned, with an ancillary valve that resembles one of the archaeological specimens (Fig. 177), was collected from Nootka Sound by the Cook expedition (cf. Force and Force 1968: 160; Giglioli 1895: 112-113).

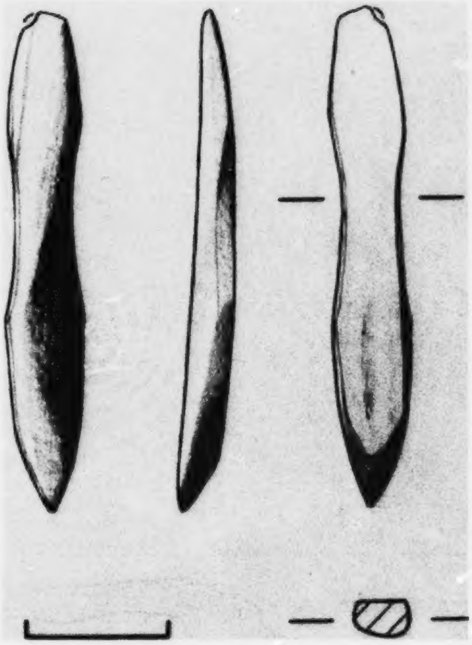


Figure 178. Ancillary valve from Zone IIa (1T2B22-1067).

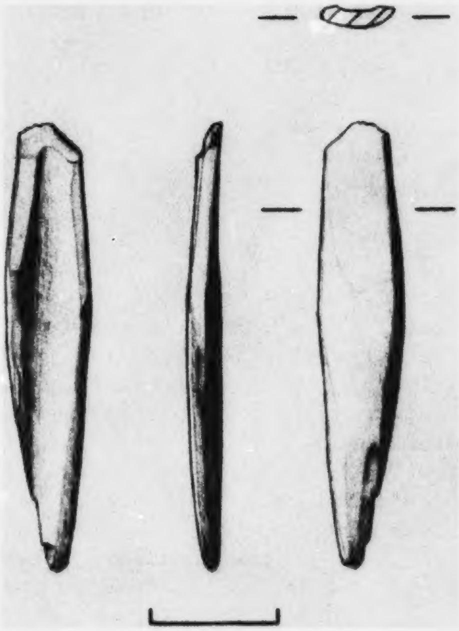


Figure 179. Ancillary valve from Zone IIIc (1T1B13-753).

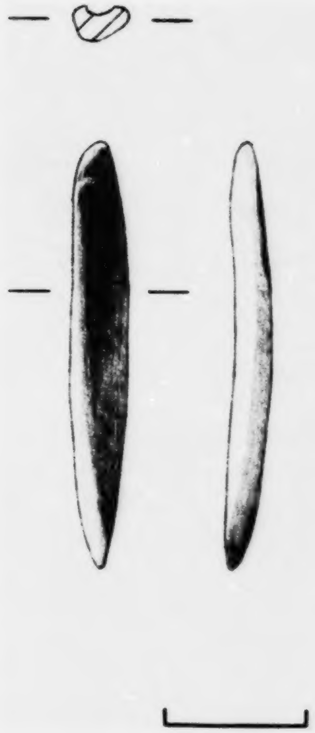


Figure 180. Ancillary valve from Zone IIIc (1T2E12-1297).

Simple valves of composite toggling harpoon heads. Twenty-one simple valves of antler (Figs. 181, 182; Table 57) from composite toggle

Table 57. Simple Valves of Composite Toggling Harpoon Heads: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Length of Contact Area	Foreshaft Socket
IIIc	1T2A13A-796	30+	8	5	14+	1 x 5
IIIc	1T3A16B-898x	60	9	6	26	2 x 6
IIIc	1T1B12-713x	50	9	4	25	1 x 7
IIIc	1T2D8-2247	42	9	5	16	1 x 6
IIIb	1T1K8-2032	61	10	7	25	2 x 8
IIIb	1T1K9-2078	50	9	6	27	-*
IIIb	1T2L9-2104	46+	10	6	-*	2 x 7
IIa	1T2A16-817	45+	8	5	15+	2 x 5
IIa	1T1B22A-947	48+	9	5	17+	2 x 5
IIa	1T3B17-5452x	61	9	7	-**	-**
IIa	1T1C21-5403x	33+	9	5	17	-*
IIa	1T1C20A-2882x	-*	-*	5	24	2 x 6
IIa	1T2C22-5405x	30+	10	4	-*	1 x 7
IIa	1T1E17-2329	-*	11	5	-*	2 x7
IIa	1T1F14C-2103	45+	11	7	-*	3 x 6
IIa	1T1J9-2297x	-*	11	5	28	2 x 8
IIa	1T1L11A-2562x	36+	7	4	15+	1 x 4
IIb	1T1J11-2377	49	10	6	23	2 x 7
no provenience	1T1X1-3203	51+	10	4	16	1 x 6
	1T1X1-3214	35	9	4	12	1 x 6
	1T1X1-3241	48+	10	6	28	2 x 6

* Incomplete.
** Uncompleted.

heads were found in Zones IIa and IIIb. The valves are termed "simple," because they are the least sophisticated valve type found at Yuquot. Most of the simple valves are plano-convex in cross section, except for four which are rectangular. The widest and thickest dimensions occur at approximately one-third of the valve length from the distal end. The maximum width conveniently allows one to distinguish distal and proximal portions. In the distal portion, the faces and lateral edges taper to a rounded or squared-off tip. The ventral face, which serves as a contact surface, is ground flat at a slight angle toward the distal tip. In the proximal portion, the ventral face and lateral edges taper to a blunt spur which acted as a barb. The proximal dorsal surface may be rounded or slightly flattened from lateral edge to lateral edge. The ventral face contains a shallow oval-shaped groove, which formed part of the foreshaft socket when the valve was attached to its mate.

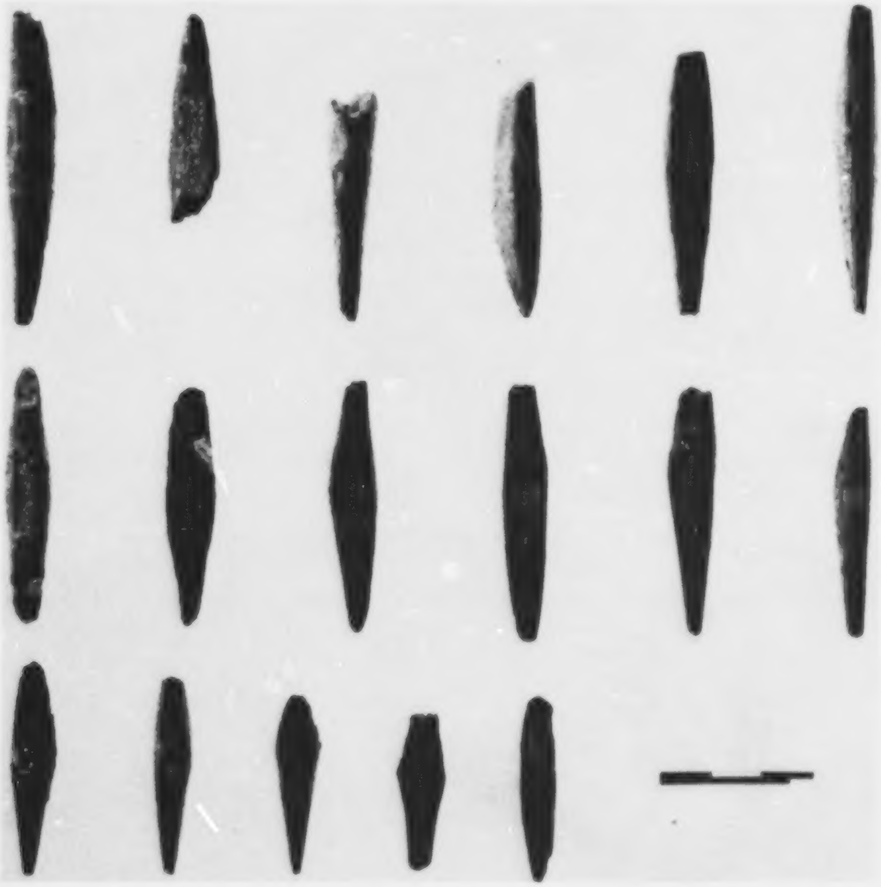


Figure 181. Simple valves, dorsal faces. (Scale for Figs. 181-185: cm, in.)

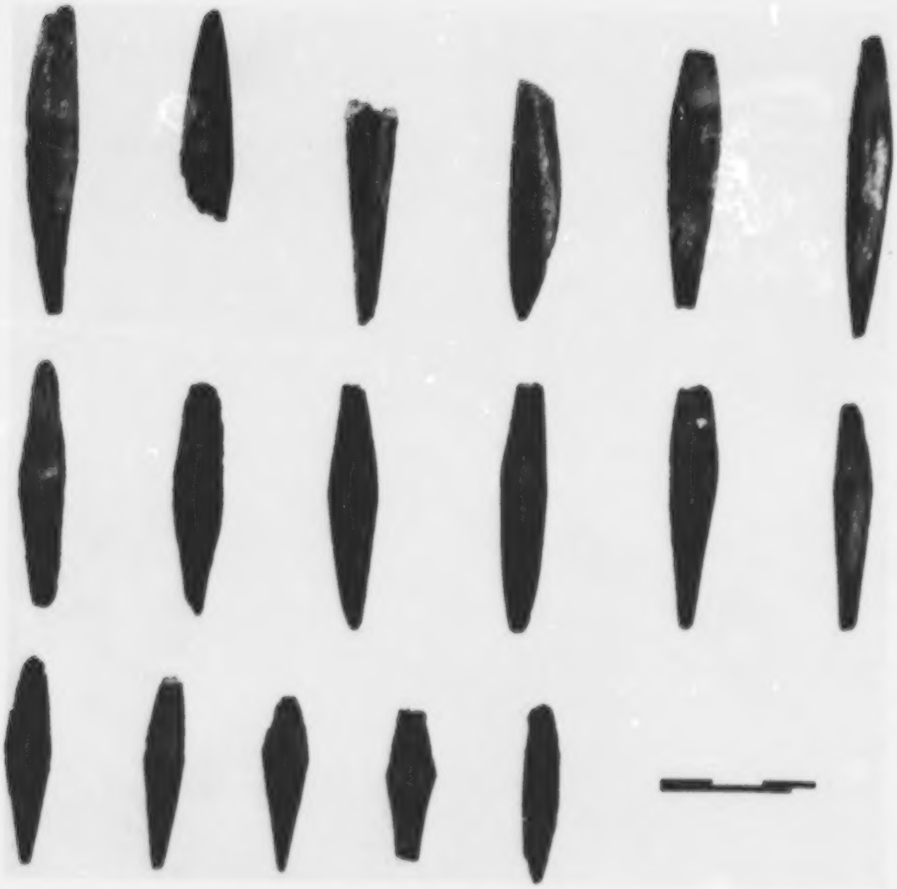


Figure 182. Simple valves, ventral faces.

The simple valves vary considerably in size (Table 57), but do not seem to cluster. Sizes appear to follow a normal curve or a continuum.

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	35-61	51.0	9.44	8
width	7-11	9.4	1.05	20
thickness	4-7	5.3	1.01	21
length of contact surface	12-28	22.3	5.50	12

None of the simple valves was found in context with its mate at Yuquot, but an "articulated" find indicates how the composite toggle heads of simple valves were formed. A complete tripartite head consisting of two simple valves and a wedge-based arming point, all like those from Yuquot, was recovered at the Rebecca Spit earthworks (EaSh-6) on the east coast of Quadra Island (Mitchell 1968: 36, 39, fig. 7t). The wrappings on this head, however, had decomposed. Composite heads with simple valves are later replaced by similar composite heads with channelled valves which have ethnographic presence. A construct of the complete composite head with wrappings (Fig. 154) is based on the Rebecca Spit find and wrappings on composite heads with channelled valves. The latter are known to have been used for salmon. Their predecessors, the composite heads with simple valves, must have also been used for salmon.

Wedged-based points. Eighty-seven wedge-based points of bone and antler (Fig. 183; Table 58), from Zones II, III and IV, likely armed composite toggle heads of simple valves.

The wedge-based points vary considerably in shape and size. Many stand out as readily recognizable, "typical" examples of arming points.

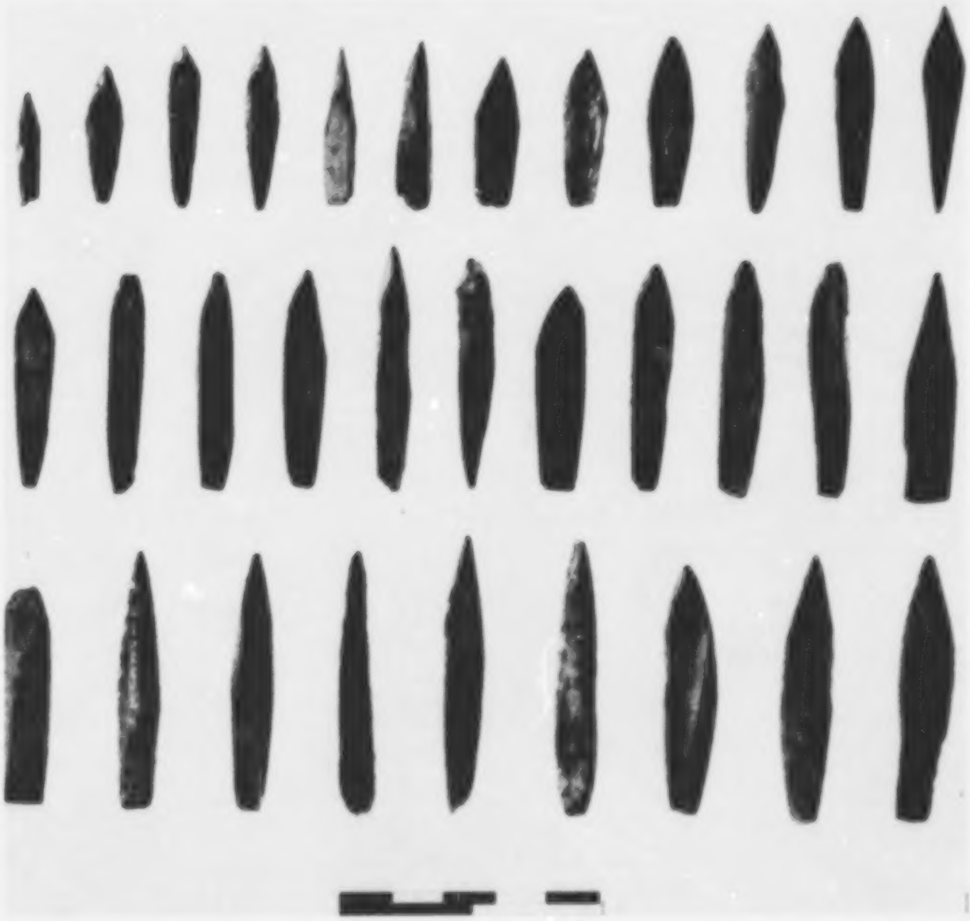


Figure 183. Wedge-based arming points.

Table 58. Wedge-Based Points: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Base Width	Angle of Point (°)
IVa	1T3A3B-123	52	6	7	7	10
IVa	1T1C6-3813x	42+	7	5	-*	30
IIId	1T1B9-681	42+	10	5	8	-*
IIId	1T3B7-578	44	8	6	5	35
IIIc	1T1A15A-861x	37	8	5	6	40
IIIc	1T2A14A-799x	43	7	3	4	30
IIIc	1T3A10-309	45+	5	5	3	10
IIIc	1T3A10-3817	33	6	5	4	35
IIIc	1T3A11-335x	34	7	5	4	35
IIIc	1T3A14A-876x	26+	7	-*	3	-*
IIIc	1T3A15-881x	41	6	3	4	20
IIIc	1T1B16A-783	40	8	3	pointed	40
IIIc	1T2B15-3808x	38	6	3	3	30
IIIc	1T1C9-5419x	27	6	4	4	35
IIIc	1T1C15B-863	32	7	5	pointed	35
IIIc	1T3C11-423	51	11	7	6	30
IIIc	1T3C14A-844x	35	6	3	3	35
IIIc	1T3C16-849x	31	7	4	pointed	60
IIIc	1T2D8-2242	48	11	5	5	35
IIIc	1T2D8-2243	36	8	4	4	25
IIIc	1T2D16-2426x	44+	7	6	pointed	45
IIIc	1T1E7-1350x	32	6	4	3	35
IIIc	1T1F10-1286	30	8	4	6	40
IIIb	1T1L8A-2547	37	8	4	4	35
IIIa	1T2B17A-918	36	8	4	5	15
IIIa	1T2B17-925x	29	7	4	4	30
IIa	1T1A17A-869x	50	9	4	5	20
IIa	1T1A24-1564	41	8	4	6	20
IIa	1T2A18-838	53+	9	3	-*	15
IIa	1T3A17A-901x	30	9	4	5	45
IIa	1T3A17A-902x	45+	8	4	5	10
IIa	1T3A17B-903x	31	7	4	-*	25
IIa	1T3A19-927x	33	8	4	8	55
IIa	1T3A19-930	22+	-*	5	-*	-*
IIa	1T1B19-807x	37+	7	3	4	20
IIa	1T1B22A-950	34	9	6	7	-*
IIa	1T1B22B-948	38+	6	5	-*	10
IIa	1T2B21A-935	42+	9	5	7	20
IIa	1T1C18A-899	39	10	4	7	55
IIa	1T1C18A-900	36	7	4	6	15
IIa	1T1C19A-907	42	8	5	5	30
IIa	1T1C20A-1087x	39	8	4	5	35
IIa	1T1C20A-1088x	33	9	4	7	50

* Incomplete.

(Cont'd)

Table 58. (Cont'd)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Base Width	Angle of Point (°)
IIa	1T1C21B-1989	33	7	5	7	15
IIa	1T1C22-1093	32	7	4	4	45
IIa	1T2D19-2675x	29	7	4	-*	20
IIa	1T2D21-2688	29	9	3	7	40
IIa	1T1E19-2335x	32	10	4	5	35
IIa	1T2E16-2027	43	8	5	6	20
IIa	1T2E18-2051	40	7	3	4	15
IIa	1T1E15-2214	36	8	4	pointed	40
IIa	1T1F16-2137	48	7	5	5	25
IIa	1T1H12-2038	32+	7	4	-*	25
IIa	1T1H13-2052	32	9	3	5	40
IIa	1T1H13-2053	38	10	4	5	55
IIa	1T1H15A-2101	44	10	6	9	20
IIa	1T1H20A-2752	29	8	4	6	20
IIa	1T1J10-2112	43	9	4	6	30
IIa	1T1J10-2358	45	9	5	5	25
IIa	1T1J16-2464	39+	10	6	8	30
IIa	1T2J10-2108	33	6	4	4	20
IIa	1T1K9-2085x	27	8	4	3	35
IIa	1T2K11A-2551	37	7	5	6	25
IIa	1T2K13A-2573x	38+	8	5	6	-*
IIa	1T2L9A-2532	55	7	4	4	15
IIa	1T1L9B-2539	44+	8	6	7	10
IIb	1T1J13-2451x	48+	6	6	5	10
IIb	1T1K11A-2142x	52	10	5	5	25
no provenience	1T1A-2653	31+	8	4	4	40
	1T3C-2656x	37	6	4	4	30
	1T1G-2484	34	10	7	8	25
	1T1X1-609	48	7	5	4	15
	1T1X1-734	45	6	5	pointed	15
	1T1X1-3005	54	9	6	4	15
	1T1X1-3022	38	8	4	3	45
	1T1X1-3026	50	8	6	6	15
	1T1X1-3056	41+	7	5	6	-*
	1T1X1-3062	34+	7	4	-*	35
	1T1X1-3112	40+	9	5	-*	20
	1T1X1-3118	34	8	5	7	40
	1T1X1-3144	26+	8	5	5	35
	1T1X1-3151	31+	7	4	-*	20
	1T1X1-3167	34	8	7	4	30
	1T1X1-3173	32	7	4	3	55
	1T1X1-3194	42	8	4	4	30
	1T1X1-3250	46	9	5	6	30
	1T1X1-3293	25+	6	5	-*	20

Others are less ideal, but usually include most key attributes. Maximum width and thickness occur where the sides and faces begin to taper to the distal and proximal ends. The distal ends are usually wide and thick, with the side angles averaging 30°. The distal portion usually occupies from one-quarter to one-third of the artifact length. On the proximal portion, the lateral edges are almost parallel or taper to the base. Cross section is rectangular or rectanguloid. The sides are either flat or rounded, but the faces are always ground flat to form a contact surface. In side view, the faces converge in a wedge-shaped base. The base is usually straight or slightly excurvate in outline, except for five that are pointed. Some bases range between 1 and 2 mm thick, but most are less than 1 mm thick.

Dimensions of the wedge-based points (Table 58) are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	27-55	38.20	7.24	64
width	5-11	7.79	1.30	86
thickness	3-7	4.55	0.99	86
base width	1-9	4.84	1.81	76
distal point angle	10-60°	29.01°	12.21°	81

The correlation of lengths and widths forms a curve or continuum of sizes, rather than apparent clusters which might be interpreted as "sizes" for specialized uses.

The blunted and broken distal ends on many wedge-based points suggest a piercing and/or projectile use. Many of the Yuquot wedge-based points are nearly identical to a wedge-based arming point found directly associated with two matched simple valves at Rebecca Spit (Mitchell 1968: 36-37, 39, fig. 7t). Such artifacts formed tripartite composite toggle heads, an earlier version of those used for salmon in historic times.

Long wedged-based points. Six wedge-based points of bone (Fig. 184; Table 59), from Zones IIa and III, are unusually long and therefore described here as a separate class. All six have long, sharp points whose sides form angles of 15° or less. The distal, pointed portion is rectanguloid to oval in cross section. The proximal one-third to one-half of the artifacts is shaped into a wedge-like base with ground flat faces. These cover an area of about 25 - 35 mm from the proximal end and suggest a contact surface. The proximal cross section is rectangular with straight or slightly rounded sides. In outline, the proximal sides are either parallel or taper slightly to a base. The base is straight in outline, and less than 1 mm thick on three artifacts. Two artifacts appear to have once had finished bases 1.5 mm thick.

Table 59. Long Wedge-Based Points: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Base Width	Angle of Point (°)
IIIc	1T1A15A-859	72	8	7	3	10
IIIc	1T2A15A-813	59	7	4	5	15
IIIb	1T2G11-1543	61+	8	5	-*	15
IIIa	1T2B17A-915	72	8	5	5	15
IIa	1T1B22A-945	62	7	4	5	10
IIa	1T1J9-2355	92	7	6	6	10

* Incomplete.

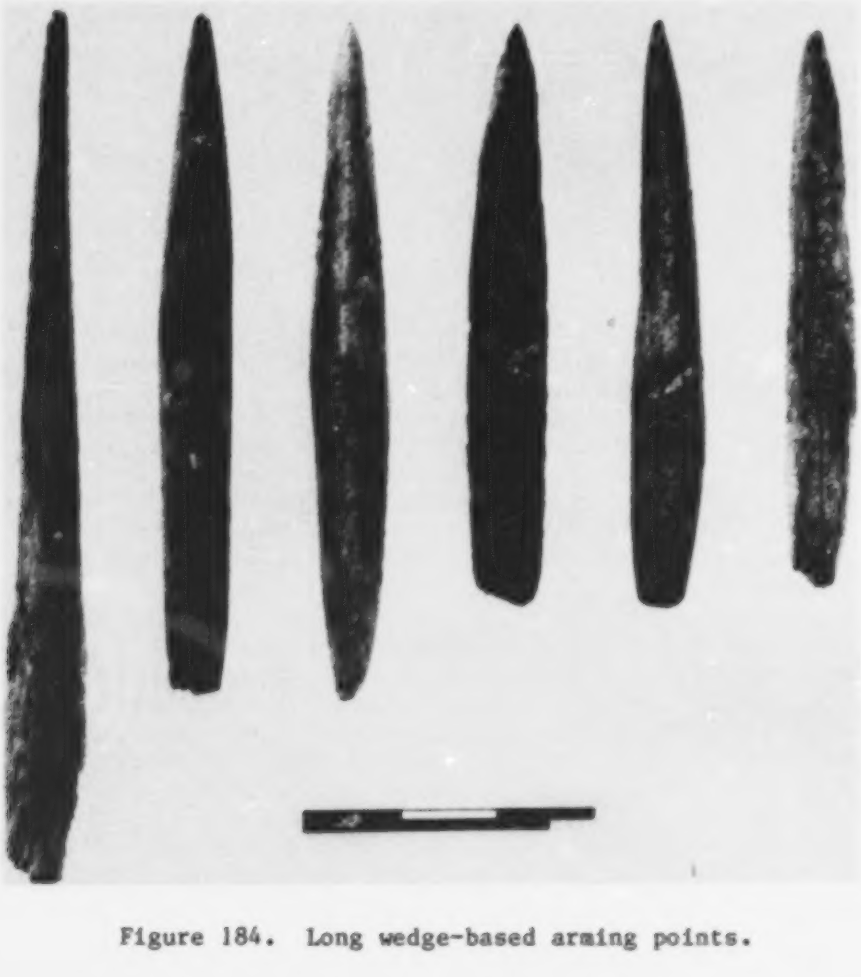


Figure 184. Long wedge-based arming points.

The artifacts vary considerably in length, but remain within very limited ranges for width and thickness (Table 59):

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	59-92	71.4	12.91	5
width	7-8	7.5	0.55	6
thickness	4-7	5.17	1.17	6
base width	3-6	4.8	1.10	5

The use of these long wedge-based points is not known. No ethnographical artifacts in the museum collections appeared to have them. The wedge-based proximal end was probably inserted or hafted into a composite artifact. The points seem too narrow to fit the description of "thin wide points of bone" used to tip arrows (Drucker 1951: 32). The points may have armed large composite toggle heads for salmon.

Short wide points with flat bases. Seven points of land mammal bone (Fig. 185; Table 60) from Zone II are short and wide with ground flat bases. Cross-sections are nearly rectangular, except for the slightly convex bone cortex on one face and remains of the concave marrow cavity. The lateral edges are nearly parallel. The distal tip is sharp, with sides forming angles of approximately 15 - 45°. The proximal end appears to be carefully made. The base is ground flat and straight or nearly straight in outline. Although some areas of the body are not ground smooth, the faces near the base are. Base dimensions are remarkably similar: base widths range from 7 to 9 mm; base thicknesses, from 3 mm to 4 mm. Other dimensions are summarized as follows:

Table 60. Short Wide Points with Flat Bases: Proveniences and Measurements (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Angle of Point (°)
IIa	1T1H13-2049	38	9	4	45
IIb	1T1J16-2471	43	9	4	20
IIb	1T1J17-2507	51	8	5	15
IIb	1T2J14-2188	48	9	5	25
IIb	1T2J19A-2777	54	12	5	25
no provenience	1T1X1-3009	40	9	5	35
	1T1X1-5457	59	12	4	30

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	38-59	47.57	7.68	7
width	8-12	9.71	1.60	7
thickness	4-5	4.57	0.53	7

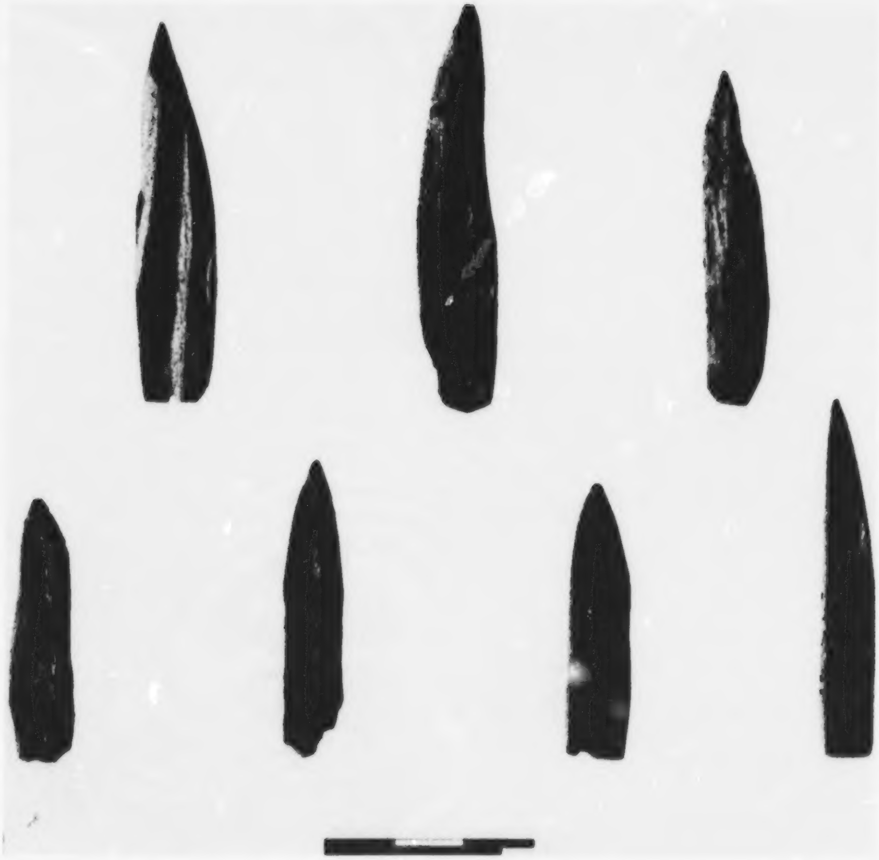


Figure 185. Short wide points with flat bases.

The use of these points is not known. The carefully made proximal ends suggest hafting of some kind, perhaps as an arming point. Although the artifacts are neither wedge-based nor blunt, they most strongly resemble the arming points of composite toggle heads. The thick bases could have been accommodated by small slotted valves.

Chanelled valves of composite toggle heads for salmon. Twenty-nine channelled antler valves (Figs. 186, 187; Table 61) are from tripartite composite toggle heads used for harpooning salmon. The valves were found at the Zone IIa-IIIb interface, and in Zones III and IV.

The valves have well-defined shape and proportions. Cross section is plano-convex. Maximum width and thickness occur from one-half to two-thirds the length of the valve from the distal tip. The maximum width enables easy differentiation of distal and proximal portions. The distal portion has a flat ventral surface to which a matching valve was lashed. This surface is channelled from the distal end to form one-half of the arming point socket when the matched valves were joined together. From the maximum width, the lateral edges and round dorsal surface taper to a flat distal tip. On several valves, the dorsal edges near the flat

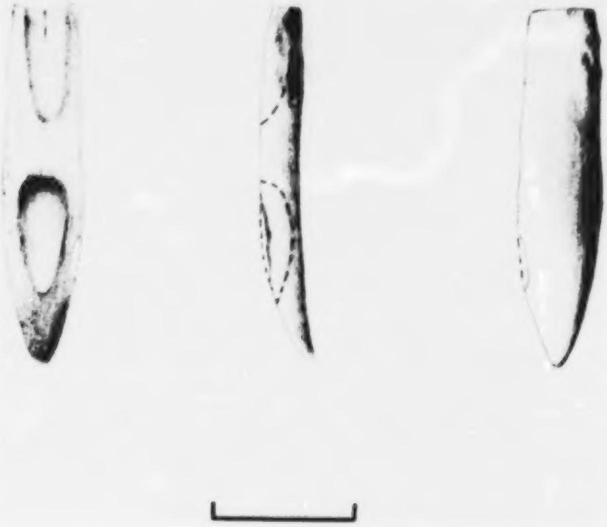


Figure 186. Complete channelled valve of composite salmon harpoon head showing from left to right: ventral face, side view and dorsal face (1T2G7A-1457) from Zone IVb. (Scale: 0-2 cm.)

Table 61. Channelled Valves of Composite Toggle Heads for Salmon: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Width of Point Bed	Depth of Point Bed	Length of Contact Area	Width of Socket	Depth of Socket
IVe	1T2J1-1358	52+	14	8	-*	-*	-*	8	3
IVd	1T1B2B-525x	48	9	4	6	3	20	6	2
IVd	1T2E2-1042	51+	12	6	5	1	29	7	3
IVb	1T2G7A-1457	53	12	6	6	2	29	7	3
IVb	1T1K3-1428	-*	-*	6	-*	-*	-*	5	2
IVa	1T1B3A-575	37	9	6	-*	-*	20	5	2
IVa	1T1B4-582	38	10	6	4	2	20	6	2
IVa	1T1D6-2014	46+	10	6	-*	-*	-*	-*	-*
IVa	1T1D8-2022	35+	9	5	-*	-*	-*	-*	-*
IVa	1T2D6-2230	42	8	5	4	2	26	4	2
IIId	1T2B8-2835x	51	-*	6	4	1	30	-*	-*
IIIc	1T2A11-2730x	42	10	6	4	2	25	6	3
IIIc	1T3A10-319	49	10	6	7	2	22	5	1
IIIc	1T3A9-3826	28+	7	3	4	1	-*	4	1
IIIc	1T1B12-2814x	39+	12	6	5	2	23	7	3
IIIc	1T1C10-2876	40	10	6	5	2	19	8	2
IIIc	1T2C9-608	53	11	6	5	1	29	5	2
IIIc	1T2C14-769	45	9	5	6	2	25	5	2
IIIc	1T1D14-2552	49+	11	7	4	2	27	6	2
IIIc	1T1F11-1969	50	-*	5	-*	-*	-*	-*	-*
IIIc	1T2F10-3363x	44+	11	7	5	3	25	7	3
IIIb	1T2K8-2499	40+	12	6	5	1	-*	8	2
IIa	1T2K9-2531x	49	13	6	3	1	26	8	2
no provenience	1T1X1-3075	35+	-*	7	-*	-*	-*	-*	-*
	1T1X1-3143	38	-*	5	4	2	15	-*	-*
	1T1X1-3223	35	7	5	3	1	24	-*	-*
	1T1X1-3260	35	9	6	5	3	18	6	4
	1T1X1-3281	-*	+13	5+	5	3	-*	-*	-*
	1T1X1-3574	-*	11	7	-*	-*	-*	7	3

* No data.

distal tip are ground obliquely. Proximally, the lateral edges and ventral face converge in a blunt spur or barb. The ventral face turns upwards at angles of 10-25°. The ventral face ground flat from edge to edge is channelled to form one-half of the foreshaft socket with a matching valve.

The valves vary considerably in size (Table 61), but do not show any well defined size clusters. Dimensions are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	35-53	44.13	6.34	16
width	7-14	10.26	1.79	23
thickness	3-8	5.82	0.98	28
length of contact surface	15-30	23.79	4.25	19
width of point bed	3-7	4.71	1.01	21

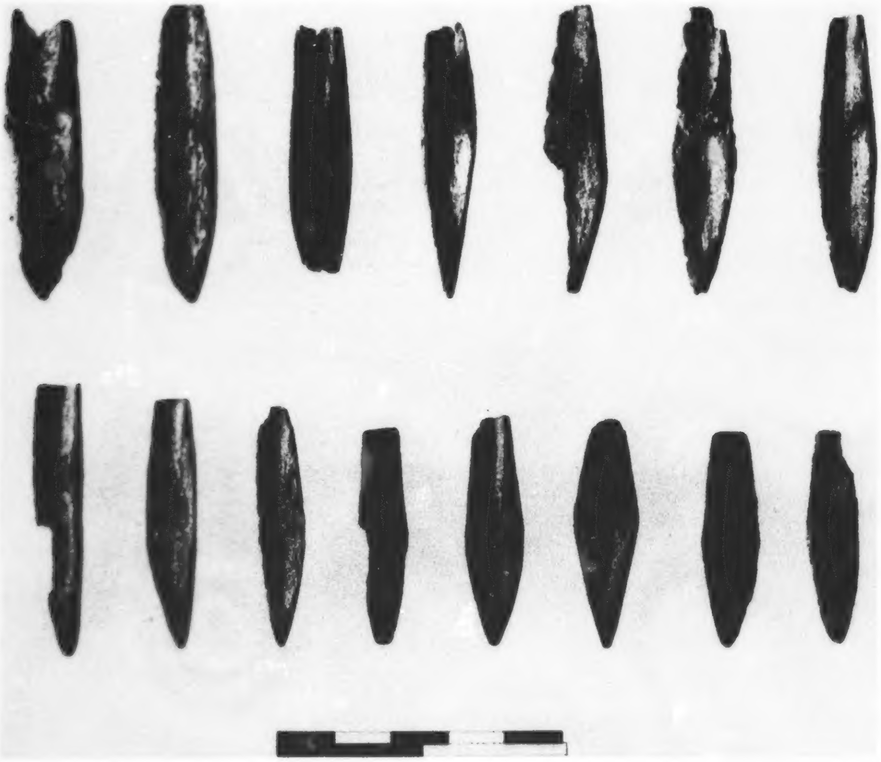


Figure 187. Channelled valves of composite salmon harpoon heads showing ventral faces. (Photo by R. Chan.) (Scale for Figs. 187-190: cm, in.)

None of the channelled valves was found in context with its mate or arming point. A composite head of channelled valves and an arming point was recovered intact from Belcarra Park (DhRr-6) (Charlton 1972: fig. 52d); the arming point is blunted and roughly biconical, similar to some recovered from Yuquot (cf. Fig. 189). Drucker identifies the channelled valves with biconical points as salmon harpoon heads (1951: 19-20). Respondents in 1969 identified the channelled valves as parts of salmon harpoon heads. They were used when the salmon ascended creeks and rivers during annual runs. A construct of the complete head with wrappings (Fig. 155) is based on archaeological and ethnographical specimens. The arming point in the construct should be more biconical, although the shape depicted is possible.

Uncompleted channelled valves of composite toggle heads. Nine carved pieces of antler from Zones III and IV are uncompleted valves of composite toggle heads for salmon (Fig. 188; Table 62). All have been whittled or abraded into blanks or preforms, but not yet channelled for an arming point and a foreshaft socket. The ventral contact surface is from one-half to three-fifths the length of the artifact, which indicates that the valves would have been channelled for arming points. The uncompleted valves vary considerably in size:

Table 62. Uncompleted Channelled Valves of Composite Toggle Heads: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Length of Contact Area
IVc	1T1H7B-1442	50	11	5	28
IVb	1T2K5A-1693	49	10	6	31
IIId	1T2A10-2727x	59	16	9	32
IIIc	1T1C15B-886	59	8	8	41
IIIc	1T1C15-5394x	70	12	9	35
IIIc	1T2C9-605	48	14	8	28
IIIc	1T1D14-2587x	40	8	5	23
IIIc	1T1A16A-2592	58	7	7	31
IIa-IIIa interface	1T3B17-5452x	61	9	8	30

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	40-70	54.89	8.92	9
width	7-16	10.56	3.00	9
thickness	5-9	7.22	1.56	9
length of contact surface	23-41	31.11	4.99	9

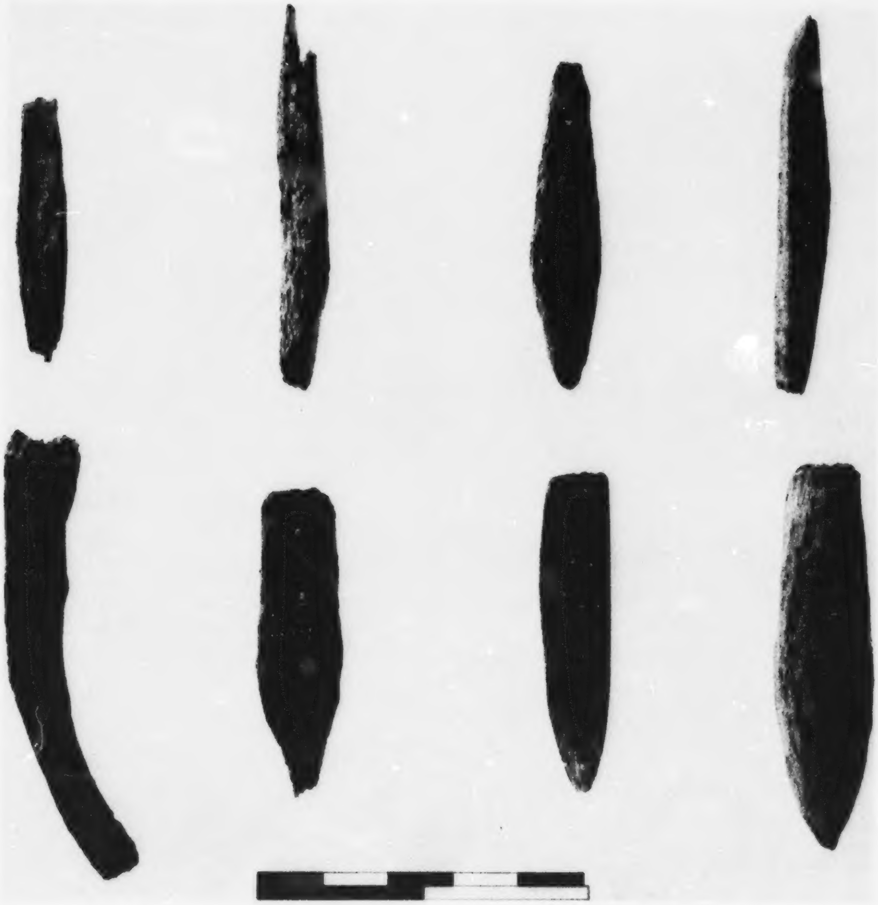


Figure 188. Uncompleted channelled valves of composite toggle heads.

Biconical arming points of composite toggle heads. Forty-nine arming points (Fig. 189; Table 63) of composite harpoon heads for salmon were recovered from Zones III and IV. The points are ideally asymmetrically biconical, with one end longer than the other. The short end, making up from one-fifth to one-third of the artifact length, is a blunt point whose sides form angles of 20 - 30°. Blunting and breakage of tips indicates that the short end was the piercing tip of the artifact. The long end, whose tapering sides form angles of 5 - 15°, includes from four-fifths to two-thirds of the length of the point. The long ends on nearly one-half of the artifacts terminate in a point; others have truncated bases, usually ground flat. Cross sections vary considerably; only a few are truly round or oval and most are rectanguloid. Most points are made of either land mammal bone or antler, except for two of sea mammal bone.

The points vary considerably in length, but remain relatively constant in width and thickness (Table 63). Length measurements plotted

Table 63. Biconical Arming Points of Composite Toggle Heads for Salmon: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Base Width	Base Thickness
IVe	1T2G4A-3390x	55+	9	5	6	4
IVd	1T1A2-165	41	6	5	6	4
IVd	1T1B1-506	42	7	5	5	4
IVd	1T2B2B-94	39	8	5	5	4
IVd	1T1C2-110x	40	7	5	5	4
IVd	1T1D2-1947x	46	6	4	5	3
IVd	1T2D1-2176x	50	6	5	5	5
IVd	1T1E2-2964x	35	6	3		
IVd	1T1F3-1204	41	8	6	3	3
IVd	1T1F4-1216	41	6	6	3	2
IVd	1T2F4-1749	35	7	4	4	3
IVd	1T2G4A-3391x	53+	8	6	6	5
IVc	1T2G7B-1451	48+	7	5	4	4
IVb	1T2F6A-1805	44	12	6	-*	3
IVb	1T2G6B-1342	51	9	7	5	5
IVb	1T2H4-1792	44	6	4	3	2
IVb	1T2J4A-1443	44	9	4	6	3
IVb	1T1K2A-1416x	45	8	7	5	4
IVb	1T1K4-1476x	30	5	3		
IVa	1T1A2-136	43	8	5		
IVa	1T1B7-667x	39	10	6	6	3
IVa	1T2B2A-87	46	8	5	4	3
IVa	1T2B2-3804x	49	7	4	4	3
IVa	1T3B2A-475x	31	5	3		
IVa	1T3B2A-488x	40	6	5	4	4
IVa	1T2D6-2228	51	8	6		
IIId	1T1A5B-265x	36	5	4		
IIId	1T1A9B-385x	26	4	4		
IIId	1T2C9-604x	34	5	4	3	3
IIIc	1T1B13-745	36	6	3		
IIIc	1T3B9-627	45	5	5	4	4
IIIc	1T3B9-628	36	7	6		
IIIc	1T3B9-639	37	8	3		
IIIc	1T1C12-835	36	5	4		
IIIc	1T2C11-646	34	6	3		
IIIc	1T3C12-836	32+	6	4		
IIIc	1T1F9-1281	31	6	5		
IIIc	1T2F12B-2311	43	8	4		
IIIc	1T1G9A-1894	45	9	6		
IIIb	1T2G10-1527	29	5	4	5	3
IIIb	1T2L6-1968x	32+	+6	5	4	3
IIIb	1T2L9-2126	31	7	4		
no provenience	1T1X1-3041	45	6	4		
	1T1X1-3210	42	7	6		
	1T1X1-3216	42+	8	5	5	3
	1T1X1-3224	48	11	9	6	6
	1T1X1-3239	35	7	7		
	1T1X1-3263	30	5	3		
	1T1X1-3306	22	4	3	3	2

* Incomplete.

against width measurements show a continuum, rather than apparent size clusterings. Measurement data are summarized as follows:

Attributes	Range (mm)	Mean (mm)	SD (mm)	Number
length	22-51	39.25	6.93	43
width	4-12	6.91	1.71	48
thickness	3-9	4.78	1.30	49
base width	1-6	3.00	1.94	48
base thickness	1-6	2.49	1.46	49

Although none of the biconical points was found with channelled valves in context, they undoubtedly armed such valves. Drucker (1951: 19, fig. 3) describes "a slender biconic tip" as the arming point for tripartite salmon harpoon heads. Excavations at Belcarra Park (DhRr-6) recovered a matched pair of channelled valves with a biconical

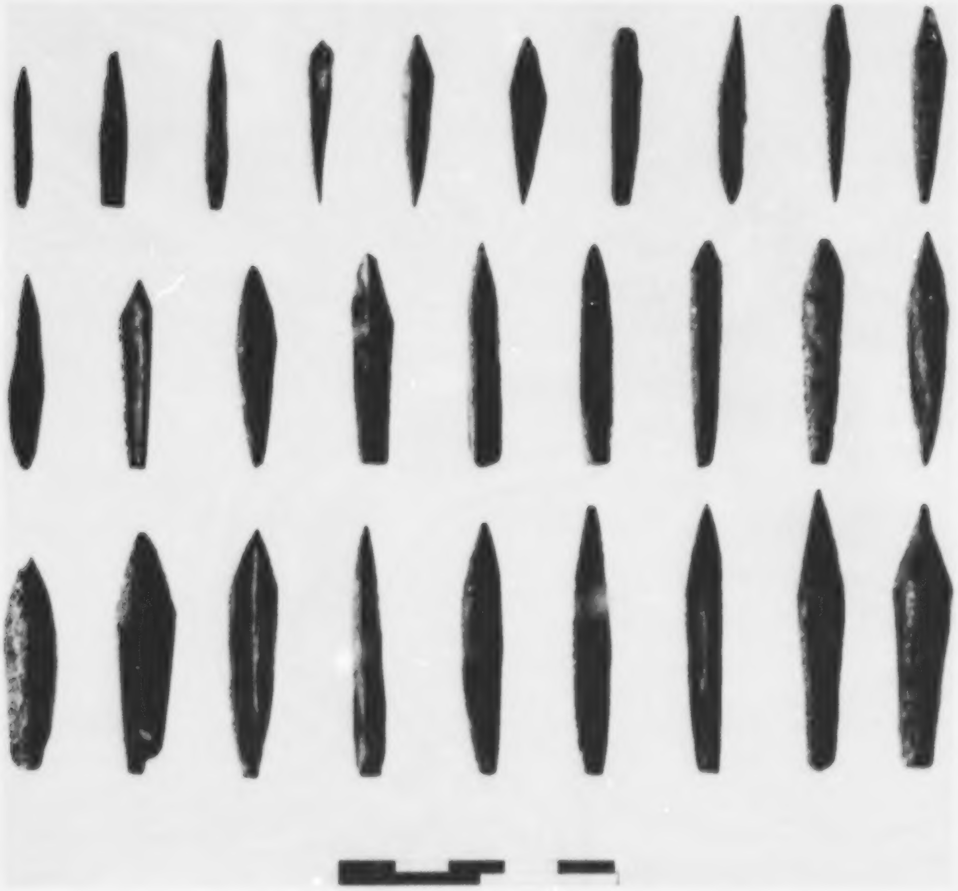


Figure 189. Biconical arming points of composite salmon harpoon heads.

arming point (Charlton 1972: fig. 52d) similar to those from Yuquot. A Nootkan respondent, after having been shown the channelled valves and biconical points separately, attempted to assemble them into a composite toggle head. Points with the truncated ends do not seem to be described in the ethnographical literature or yet recovered archaeologically with channelled valves. The close similarity of the truncated in size and shape to the truly biconical indicates that both likely had the same use.

Proximal fragments of valves. Six artifacts are proximal fragments of toggle head valves; they are too incomplete to allow further definite identification. Various valves may be represented. Three fragments from Zone IIa, with irregular upturned barbs and undefined foreshaft sockets (Fig. 190), may have come from self-armed or ancillary valves. A fragment with a short spur and defined foreshaft socket (Fig. 190e), from the upper levels of Zone IIa, may have been a channelled valve. A large blunt spur and defined foreshaft socket on a fragment (Fig. 190f) from Zone IIId suggests a small slotted valve. A fragment from Zone IIIc (Fig. 190d) may also be the proximal tip of a slotted valve.

Single-piece toggle head. A single-piece toggle head, from the upper levels of Zone IIIb at or near the interface with Zone IVb, is based on the tip of an antler tine (Fig. 191). The tine tip has been ground to a very sharp point, roughly oval in cross section. Cancellous tissue at the open end of the tine was removed to form a basal socket 4 mm in diameter and 10 mm deep. On each side of the socket opening are two small opposing symmetrical spurs. The artifact measures 48 mm long, with a maximum diameter of 9.5 - 10.5 mm.

The general shape and size of the artifact suggest that it is a single-piece version of the composite toggling harpoon heads for salmon. A single-piece toggle head with eyelet was used by the Hesquiat for salmon (Drucker n.d. b) and by the Nuchatlet for salmon and steelhead (Drucker n.d. a: Vol. 2, pp. 3, 9). Although the Yuquot artifact does not have a transverse line hole, the retrieving line could easily have been tied around the middle, as on the composite toggle heads used for salmon. No single-piece toggle heads were seen in the museum collections studied.

Leisters

Twenty-one artifacts are believed to have been parts of leisters or the ethnographically known leister-harpoon. The latter device had a detachable composite head of two springy wooden arms armed with inwardly turned bone or antler points (see Drucker 1951: 21; Weber 1976: fig. 13). A curious whalebone artifact recovered may be a bone version of a leister arm. Another artifact is possibly a centre point which projected between the leister arms; however, the historical Nootkan leisters do not seem to have had centre points. The other artifacts recovered are all varieties of sturdy bone points which appear too large for composite fish-hooks, but certainly within the range of shapes and sizes of side points on collected Nootkan harpoon-leisters.

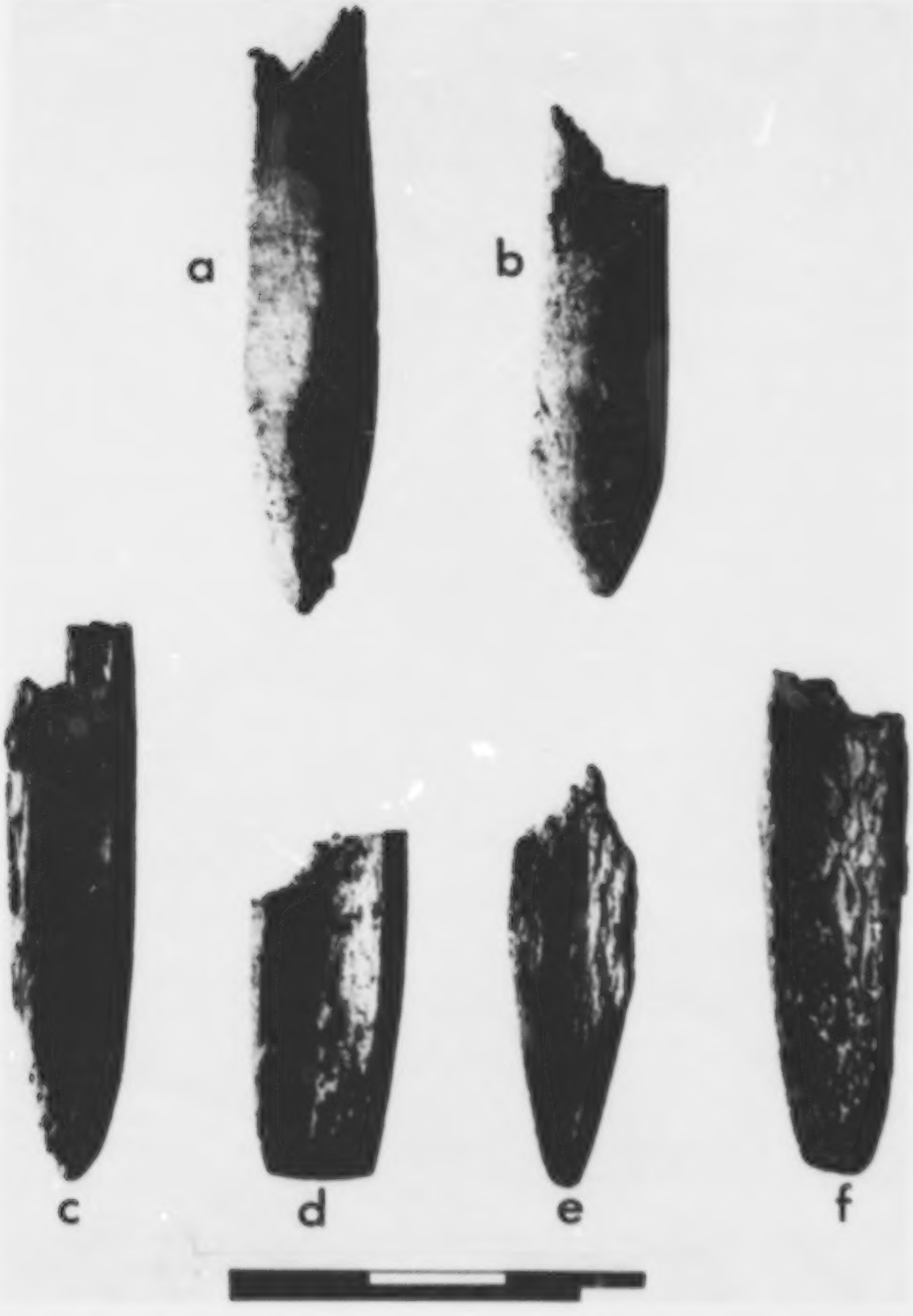


Figure 190. Proximal fragments of valves. Dorsal views: a, 1T1H18B-3420x; b, 1T3B22A-1110. Ventral views: c 1T1H17-2149; d, 1T1G9A-1881; e, 1T2K10A-2536; f, 1T1A8B-364x. (Photo by R. Chan.)

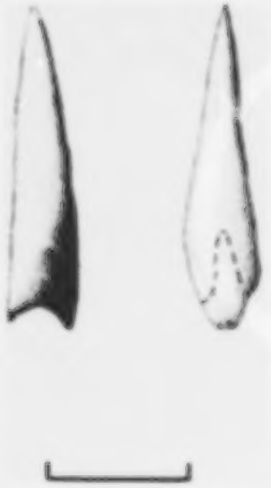


Figure 191. Probable single-piece toggle head for salmon (1T1J5-1736), based on tip of an antler tine. (Scale: 0-2 cm.)

Harpoon-leister arm. One artifact of whalebone (Fig. 192) from Zone IIIc is likely an uncompleted arm of a harpoon-leister. Cross section is rectanguloid. At the narrow end, one face is ground flat and slightly recessed for 75 mm from the end. Such flattened faces in Nootkan artifact technology usually serve as contact surfaces of composite artifacts. The other end expands into a spatulate-like shape. Two opposing grooves, 8 - 10 mm wide and 3 mm deep, cut across the lateral edges. Between the grooves is an opposing depression on each face, the start of a biconical perforation. It appears to have split

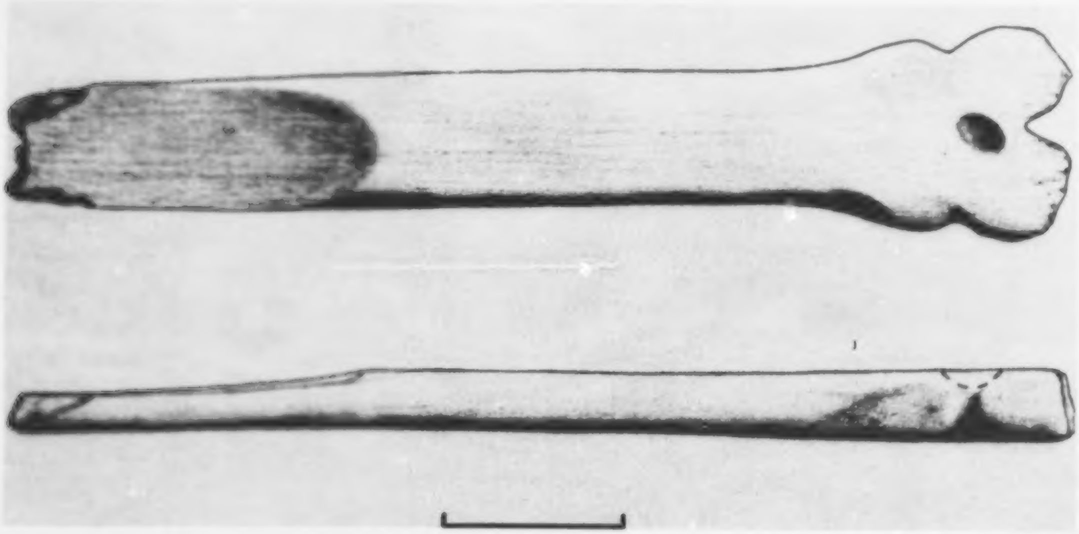


Figure 192. Possible uncompleted arm of a harpoon-leister (1T1E12-1513). Whalebone. (Scale: 0-4 cm.)

the bone, and caused a wedge-shaped fragment to break from the end. This defect probably made the artifact useless and is likely the reason why it was uncompleted. The artifact is 223 mm long, 28.5 mm wide and from 12 to 14 mm thick. The contact surface portion ranges from 8 to 11 mm thick.

The artifact shares attributes with the arms of harpoon-leisters collected historically (cf. Weber 1976: Fig. 13; AMNH Cat. Nos. 16/1733, 16/1734, 16/1735, 16/1736, 16/9765). The end of the whalebone arm would have been perforated for insertion of an inwardly facing bone barb. Arms are attached on a flattened contact surface. Cross section is rectanguloid. The perforation in the middle of the arm is not present on the artifact, probably because it was uncompleted.

Such harpoon-leisters were used for spearing salmon through log jams (Drucker 1951: 21). They may also have been used, in conjunction with a spinning lure, for catching lingcod (Carl 1975: 53).

Probable centre point of leister. A nearly completed whalebone artifact from Zone IIb is a long thin point which expands into a spatulate-like base (Fig. 193). The distal tip is very sharp, obviously intended for piercing. The point cross section is square with rounded corners for approximately 155 mm from the distal tip; width and thickness vary from 7 to 9 mm. The base is almost rectangular in cross section and outline. Its slightly tapered flat faces terminate in a flat end. Maximum width of the base is 21 mm, maximum thickness, 9 mm. A biconical perforation 1.5 mm in diameter penetrates the middle of the base near where it merges with the point. Near the centre of the base is an uncompleted biconical perforation: a saw groove entering each face from the end is modified by a conical depression of the uncompleted perforation. All surfaces of the artifact are ground smooth and polished. The artifact is 233 mm long.

No artifacts resembling the bone point were seen in the Nootkan ethnographical collections or appear to be described for northern and central Nootkan groups. The perforations suggest that the point was to be fixed to a shaft. The flat faces of the base could have served as contact surfaces for a composite artifact. The point is reminiscent of

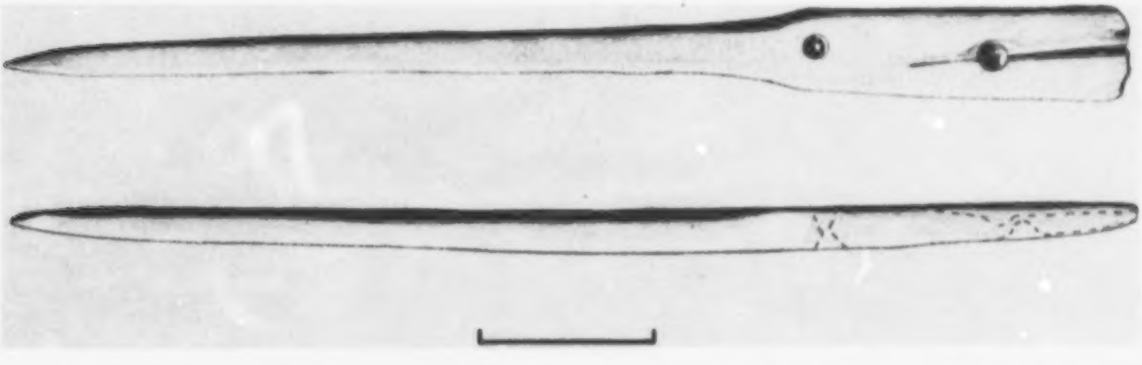


Figure 193. Probable uncompleted centre point of leister (1T1J17-2473). (Scale: 0-4 cm.)

the long centre points of three-pronged leisters used historically by other Northwest Coast cultures (Stewart 1977: 74). Perhaps leister arms would have been attached to each face.

Large whole bird bone. Four large whole bird bone points are shafts ground to a sharp point with sides forming angles of 10 - 25°; there is otherwise little or no further modification to the shaft (Fig. 115). The points were made in the same manner as those on the whole bird bone points described earlier. The other ends are rough and unfinished. One cannot determine for certain whether they are uncompleted, or fragmentary, or complete but unfinished. Dimensions (in mm) and proveniences are as follows:

Zone/Stratum	Artifact No.	Length	Point Width	Point Thickness
IVc	1T2F8A-3738x	58+	5	7
IVa	1T3A4-156x	tip	7	6
IIId	1T1A10-2716x	89+	10	8
IIIc	1T1F5-1243	65+	7	9

The large whole bird bone points are protohistoric and historic, but were not found on any composite artifacts in the ethnographical collections studied. The points seem too large for use as arming points of composite fish-hooks. The sharpness and sturdiness, however, would make the points suitable for leister side points.

Large unbarbed points. Twelve large unbarbed points of land mammal bone (Fig. 194; Table 64) were recovered from Zone Ib and the

Table 64. Large Unbarbed Points: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Angle of Point (°)
IIa	1T1A27-1589	83+	10	5	10
IIa	1T3A18A-2805x	67+	11	7	15
IIa	1T1B23A-1103	81+	10	5	25
IIa	1T1B24-1109	84	11	6	15
IIa	1T3B24C-1147	62+	10	4	-*
IIa	1T1C26-1567	94	10	5	-*
IIa	1T1E21-2288	53+	10	4	-*
IIa	1T2G16-1993	55+	13	7	-*
IIa	1T2J11A-2132	69+	11	6	15
Ib	1T3F30B-2518	73+	9	5	-*
Ib	1T2G23B-2650	66+	9	5	-*
no provenience	1T1X1-3087	99	13	6	15

* Incomplete.

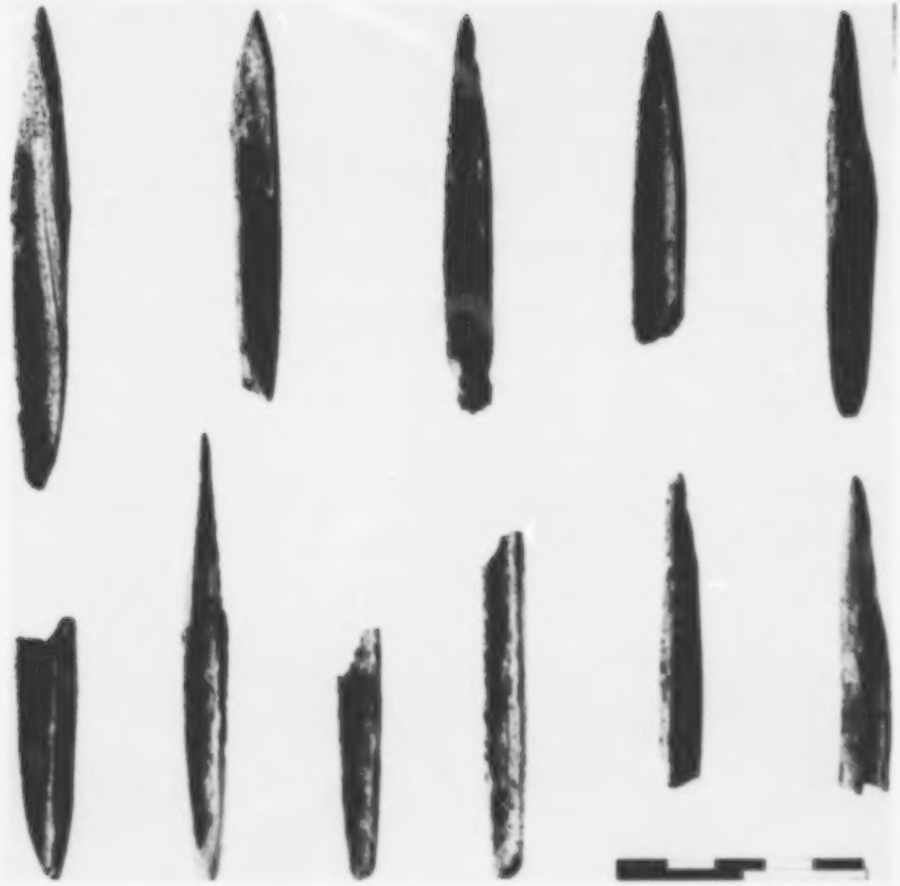


Figure 194. Large unbarbed points. (Scale for Figs. 194-199: cm, in.)

lower half of Zone IIa. Cross sections are rectanguloid or concavo-convex. The naturally convex bone cortex is mainly unmodified, and the thin lateral edges formed by splitting are ground flat. The face with the marrow cavity is also ground flat to some degree, but frequently much of the deep marrow cavities remain, thereby accounting for the concavity in cross sections. One end is a blunt point whose sides form angles of 10 - 25°. The other end is rounded in outline and tapered slightly on the lateral edges and ventral face. Only three artifacts are complete enough for meaningful length measurements (see Table 64). Primary dimensions are summarized as follows:

Attribute	Range (mm)	Mean (mm)	SD (mm)	Number
length	84-99	92.33	7.64	3
width	9-13	10.58	1.31	12
thickness	4-7	5.42	1.00	12

No bone points like these were seen on any Nootkan artifacts in the museum collections. The large unbarbed points, however, do have attributes common to bone points on certain ethnographical artifacts. The rounded proximal ends with tapered sides and ventral face are found on points lashed to fish-hook shanks and harpoon-leister arms. The unbarbed points are large and blunt enough to have been fixed points on leisters of some kind. The artifacts could perhaps have also armed large fish-hooks; however, no points of this size were seen on the Nootkan ethnographical fish-hooks.

Short, stout, unbarbed points. Three short, stout unbarbed points (Fig. 117d,e,f) were found in the upper levels of Zone IIId and in Zone IVa,d. The points have sharp distal ends whose sides form angles of 25 - 35°. The points are roughly biconvex in outline. Cross sections are rectanaguloid, except for remains of the concave marrow cavity. The proximal ends are either blunt or flattened, with tapering lateral edges and ventral face. Two points have poorly defined reddish-brown horizontal stains. Proveniences and dimensions (in mm) are as follows:

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVd	1T2E3-1218	57	12	7.5
IVa	1T3B6-566	67	11	6.0
IIId	1T3A6-566	63	13	8.0

The points are from protohistoric and historic period deposits and theoretically could be found on Nootkan artifacts in museum collections. The points are too blunt and too thick to arm the U-shaped or sharp-angled fish-hooks. The points have no well-defined contact surfaces or tangs. The poorly defined stains suggest plant fibre lashings; the tapered rounded proximal ends are not unlike those on lashed arming points. The short unbarbed points are within 8 mm of the lengths of points arming some harpoon-leisters, but are nearly twice as wide and thick. Perhaps these points are a slightly stouter variation for harpoon-leisters.

Toggles

Two complete artifacts of land mammal bone may have been toggles for harpoon or fishing lines.

One of these artifacts, from the lowest levels of Zone IIa, is very carefully shaped (Fig. 152i). In outline, it is rectangular with slightly convex ends. The lateral edges are straight and ground flat. Both faces have fine bevels, 1.5 to 3 mm wide, along the lateral edges. Both faces are slightly concave lengthwise. Both ends are wedge-like, with bifacial bevels from 4 to 6 mm wide and ends 1.5 mm thick. All surfaces are ground smooth, but not worn. The middle surfaces of both faces and sides bear heavy reddish-brown stains. The artifact is 47 mm long, 10 mm wide and 4 to 5 mm thick.

Two attributes suggest use as a toggle. The reddish-brown stains, like those on the bone parts of many Nootkan ethnographical artifacts, were probably produced from long contact with plant fibre lashings. The unworn, blunt wedge-like ends are unsuitable for splitting or piercing, but could be easily passed through loops without catching on them. Small toggles, similar to this in size, were attached to harpoon-leister heads for fastening retrieving lines.

The other artifact, from Zone IIIc, is less elaborate (Fig. 152j). It is rectanguloid in cross section and crudely elliptical in outline. All surfaces are ground smooth. Both ends are blunt and unworn. The artifact is 62 mm long, 8 mm wide and 4 mm thick. It was possibly used as a line toggle.

Utilitarian Club

A nearly complete club fashioned from a whale rib (Fig. 195) was recovered from the interface of Zones IIa and IIIa. Apart from cutting or breaking the rib to a desired length, the only modification was to chop away bone along both narrow sides at one end to form a crude handle. The rib in cross section is naturally roughly tear-shaped. The naturally thin rounded edge appears to have been the striking blade. The club is 410 mm long, and at the largest section, 65 mm wide and 36 mm thick.

No clubs like this were seen in the Nootkan ethnographic collections examined. The rudimentary shaping and lack of workmanship suggest that the club was used or intended for utilitarian purposes, perhaps killing fish.

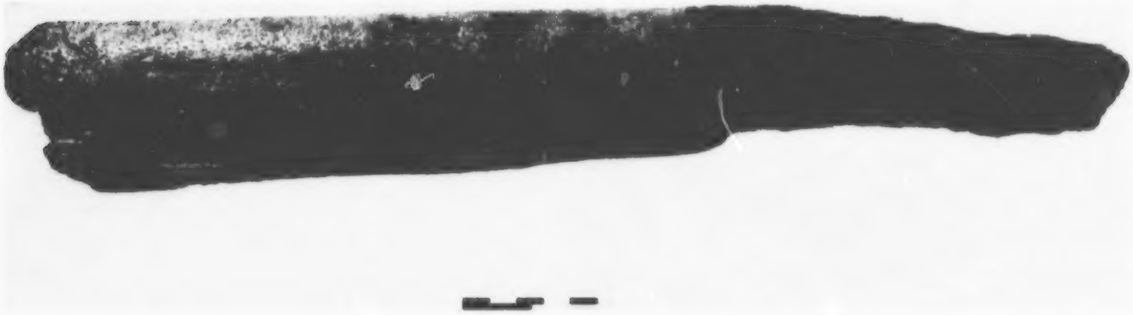


Figure 195. Utilitarian club fashioned from a whale rib (1T2E14-1966).

Possible Herring Rake Tine

The attributes of a point of land mammal bone (Fig. 196c), from Zone IIb suggest use as a herring rake tine. The point is rectanguloid in cross section. One end is ground to a sharp tip with straight sides forming an angle of 5°. The other end has been tapered slightly on the sides and faces, probably for insertion into a narrow socket. The base appears to have broken off naturally flat. The tapered portion is stained dark reddish brown. The point is 48 mm long, 4.5 mm wide and 2 mm thick.

Sharp bone or wood points were formerly used as the tines of herring rakes and then replaced by nails or wire in the historic period. The tines were inset in a hardwood shaft and secured with spruce gum. The end of the bone point is tapered, perhaps for insertion in a hole. The tapered end is stained, like bone points having had contact with wood, plant fibres and spruce gum on composite artifacts. The unstained portion of the artifact is 43 mm long, close to the upper range of tine lengths recorded for one rake (Stewart 1977: 77). No herring rakes in the ethnographical collections examined had bone tines.

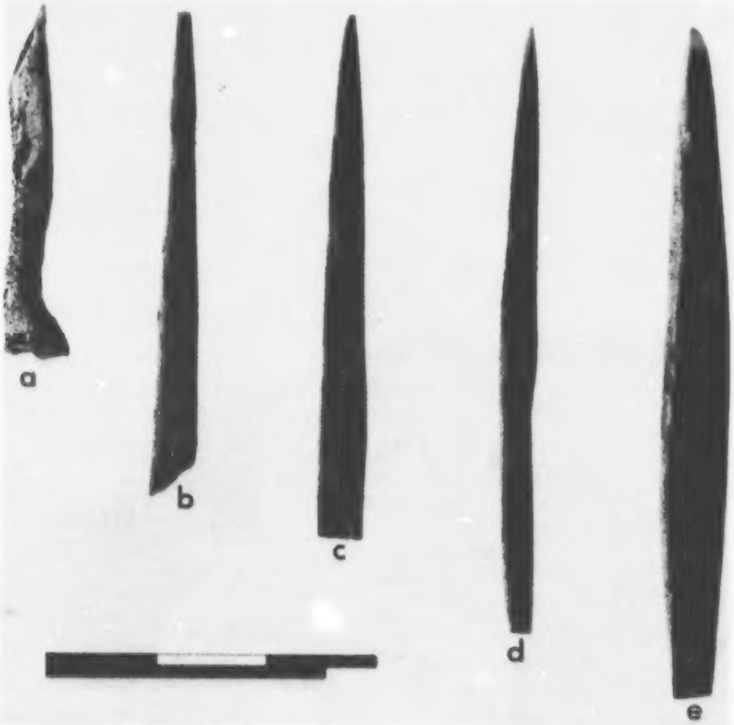


Figure 196. Possible herring rake tine and other bone points: a, bird bone awl or barb (1T1A15B-284); b, point with constricted tip (1T1C14-2877x); c, possible herring rake tine (1T1J16-2468); d, thin point with tang (1T1E26-2479); e, point with tang (1T2B18-932x).

Miscellaneous Points

Fifty-eight unbarbed points of land mammal bone, antler, bird bone and fish bone do not fit well into the artifact classifications. Composite artifacts in ethnographical collections sometimes have crudely made or unfinished points that contrast sharply with the usual attribute pattern of a point type. Many of the miscellaneous points are likely "oddballs" which did not conform enough to the usual pattern to be recognized by the archaeologist. Many miscellaneous points, for example, have the attribute of spindle shape or biconvexity, but it is not rendered consistently enough for the archaeologist to recognize the artifacts as spindle-shaped points, or as another patterned shape. The large number of the miscellaneous points makes extensive description of them unfeasible. Therefore, only several specific miscellaneous points will be discussed here. Proveniences, artifact numbers and dimensions are given in Table 65.

Table 65. Miscellaneous Points: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness
IVd	1T2B2C-84x	70	8	7
IVd	1T2B2C-91x	72	9	4
IVd	1T1E4B-1314x	62	8	5
IVd	1T2G3-1729	58	5	3
IVc	1T1H6B-1424	73+	3	3
IVa	1T2E4-1244	72	6	4
IIId	1T1A6B-327x	51	6	4
IIId	1T3A6-213	77	8	5
IIIc	1T1A15B-284	33	4	3
IIIc	1T1B11-695	59	7	5
IIIc	1T3B9-631	125	5	3
IIIc	1T3B10-645x	52	8	6
IIIc	1T3B11-755x	57	8	4
IIIc	1T1C15B-862	58	8	5
IIIc	1T1C14-2877x	45+	4	2
IIIc	1T3C9-410x	47	7	4
IIIc	1T3C12-828	59	7	4
IIIc	1T1D15B-2589	48	7	3
IIIc	1T2D8-2244	90	9	5
IIIc	1T2D11-2296	57	10	6
IIIc	1T1F9-1282	66	8	5
IIIb	1T2G8-1507x	43	8	6
IIIa	1T2E14B-1967	48	7	3
IIa	1T2A25-1193	48	7	2
IIa	1T3A19-924	80	7	4
IIa	1T1B27-1177	65	14	8
IIa	1T2B18-932x	62	6	3
IIa	1T2B22-3559x	50	6	4
IIa	1T3B21A-1101	99	8	5
IIa	1T3B24C-1150x	57+	9	7
IIa	1T3C24-1069	63	9	4
IIa	1T1E21-2287	68	12	9
IIa	1T2E14A-1971	141	8	5
IIa	1T1G15-2327	54	10	5
IIa	1T1H14A-2054	70	10	4
IIa	1T1J15-2432	72	9	7
IIa	1T1K13-2190	60+	9	4
IIa	1T2K11A-2526	50+	7	5
IIa	1T1L11A-2563x	50	8	4
IIa	1T2N2-1983	77	8	7
IIa	1T2N7-3543x	60	19	9
IIa	1T3N4A-1973	51	7	4
IIa	1T3N4A-1974	67	7	4
IIb	1T1H18B-5365x	78	11	5
IIb	1T2H14A-2348	59	10	5
IIb	1T1J16-2470	67	9	5
IIb	1T2K15-2583	74	8	5
Ib	1T1E23-2394	57	7	3
Ib	1T1E26-2479	56	4	3
no provenience	1T2F-2487	62	7	4
	1T1X1-3055	78	11	8
	1T1X1-3063	66	9	6
	1T1X1-3070	47	8	3
	1T1X1-3085	97	7	6
	1T1X1-3101	46	10	5
	1T1X1-3130	45	6	4
	1T1X1-3233	40	9	4
	1T1X1-3235	60	8	3

Two biconvex points with very sharp distal tips, 1T3N4A-1974 (Fig. 198a) and 1T3N4A-1975, were found together. The ground flat faces formed a contact surface for each other, so that one end of the composite artifact consisted of two sharp points of unequal length. Presumably the two artifacts were lashed together. This suggests some of the arrow points found at Ozette (for example: WSU Cat. Nos. 45CA24B70/162/V/8, 45CA24/B70/163/VII/21).

A fragmentary artifact (Fig. 196b) has an unusual symmetrical tip with a slight constriction near the end. This may be a decorative attribute and suggests that the artifact may have been part of a pendant or a comb.

Two slender points of land mammal bone (Fig. 196d,e) have carefully made tapered rectangular proximal ends which may have fitted into a socket or haft, such as on a herring rake.

An unusual artifact of land mammal bone or antler (Fig. 199a) is extremely concavo-convex in cross section. Perhaps it is an uncompleted or unusual composite harpoon valve.

Some 25 sturdy points with sharp distal ends have asymmetrical or tapered or truncated proximal ends; at the middle or near the proximal ends there is often biconvexity or an asymmetrical thickness (Figs. 197-201). These attributes and the general sturdiness of the points would make them suitable for side points on harpoon-leisters; some of the narrower artifacts might have served as fish-hook points.

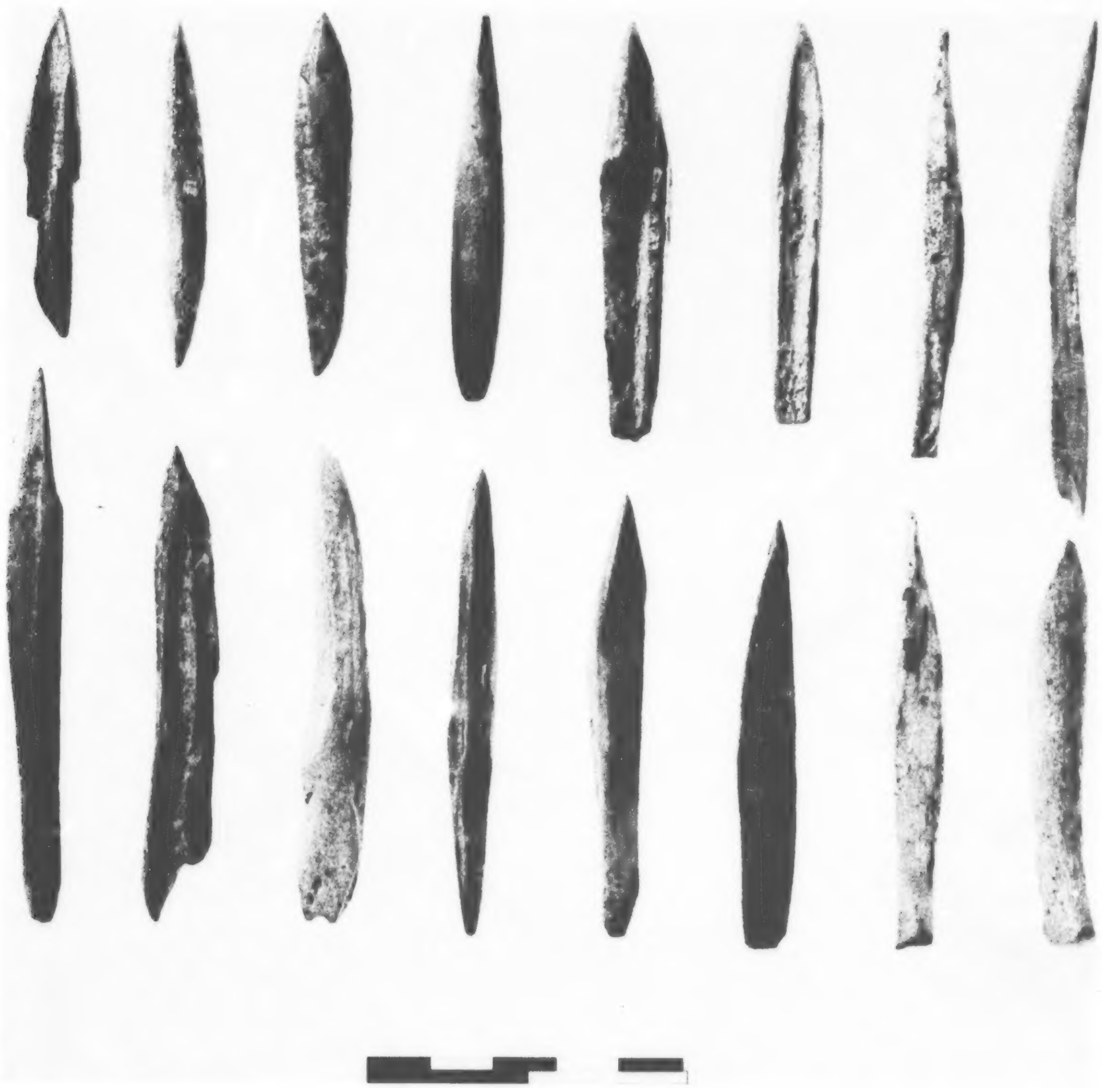


Figure 197. Miscellaneous points.

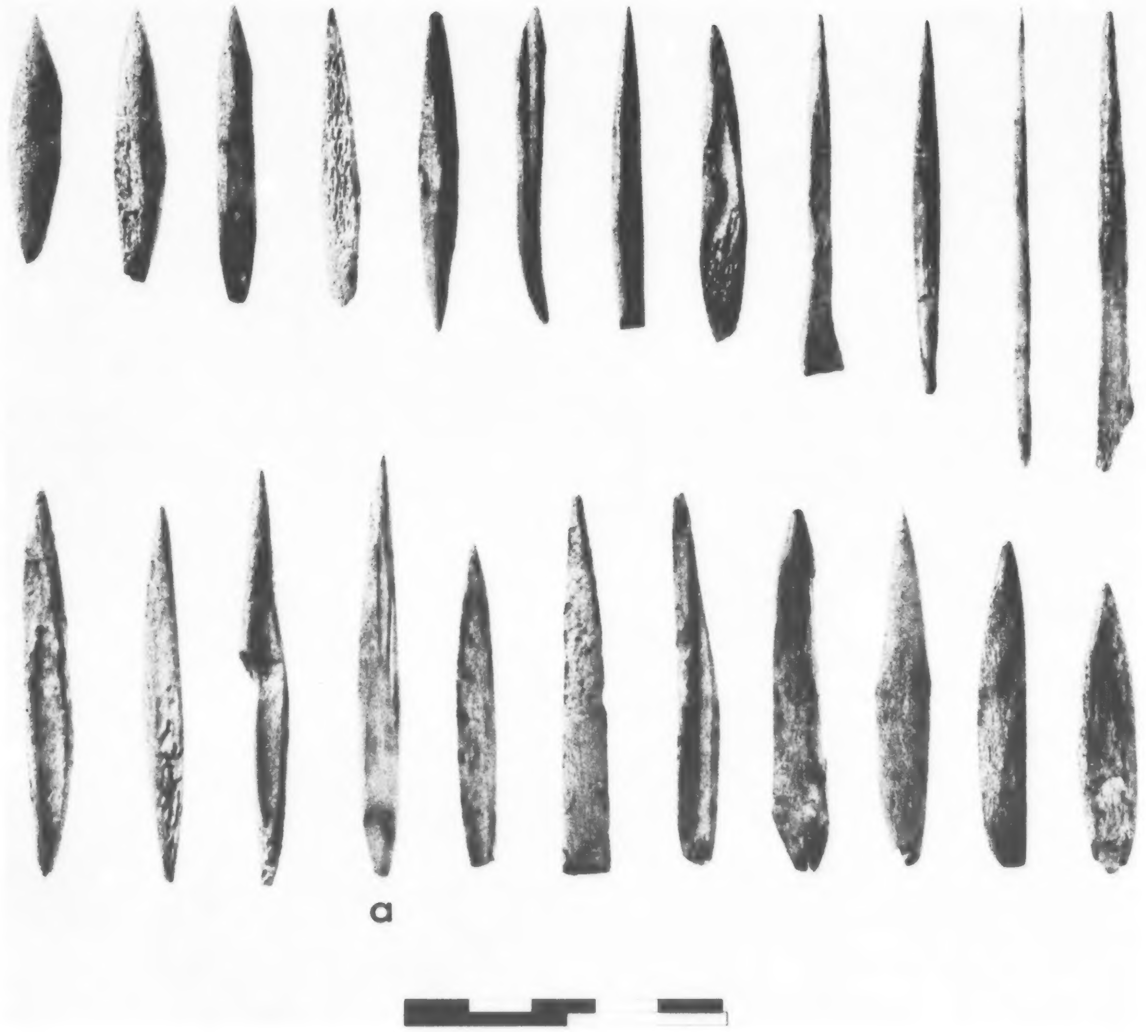


Figure 198. Miscellaneous points; a, biconvex point with sharp distal tip (1T3N4A-1974).

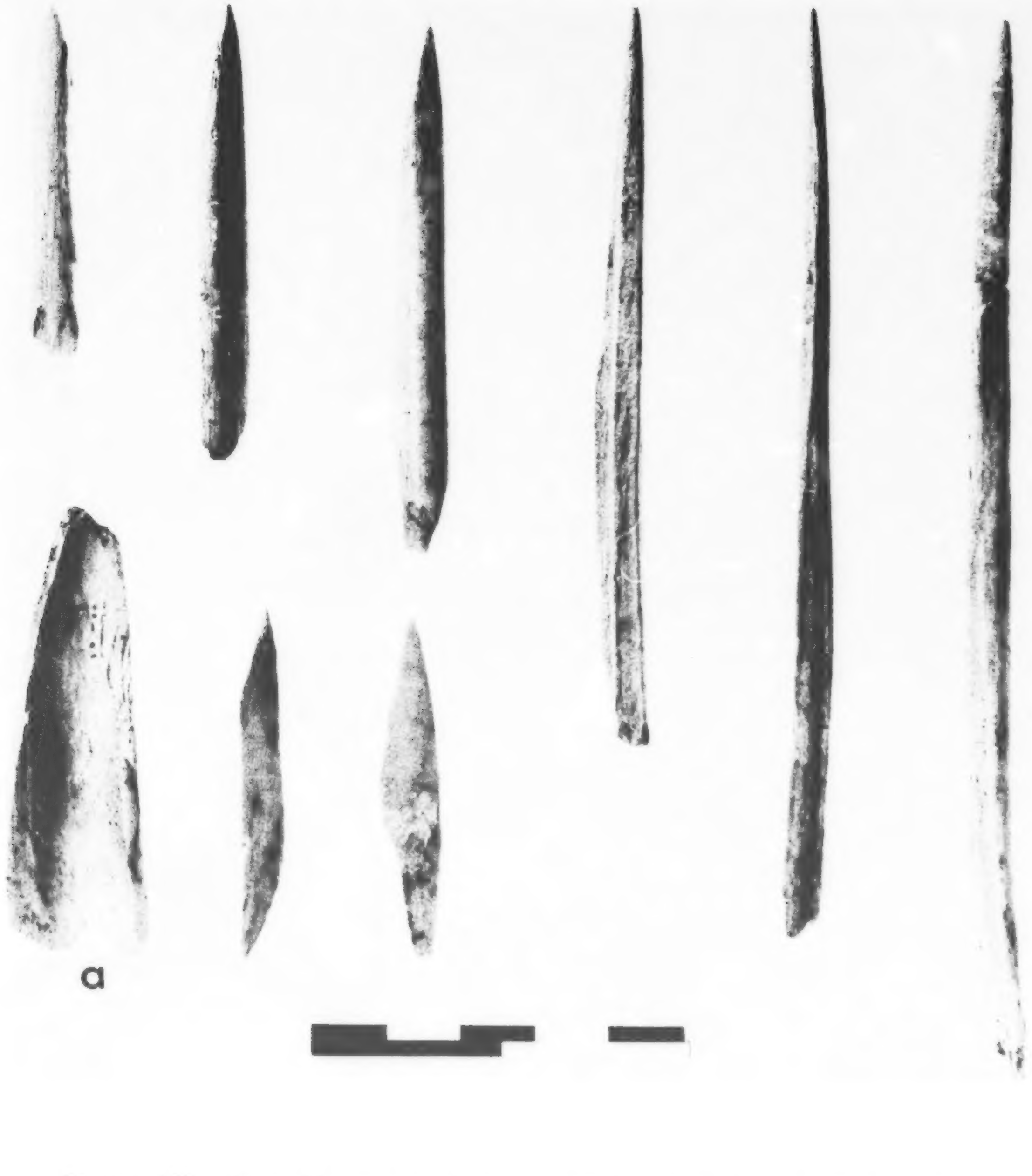


Figure 199. Miscellaneous points; a, artifact of land mammal bone or antler concavo-convex in cross section.

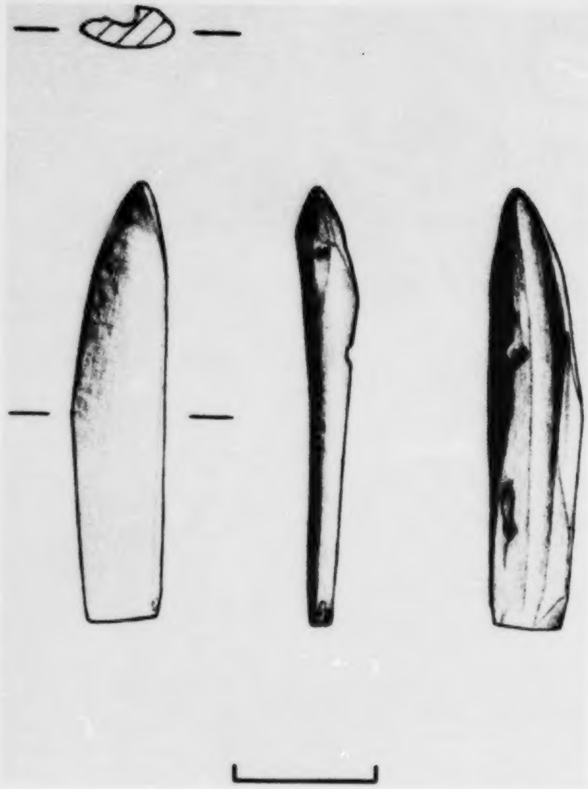


Figure 200. Miscellaneous point (1T1B27-1177).

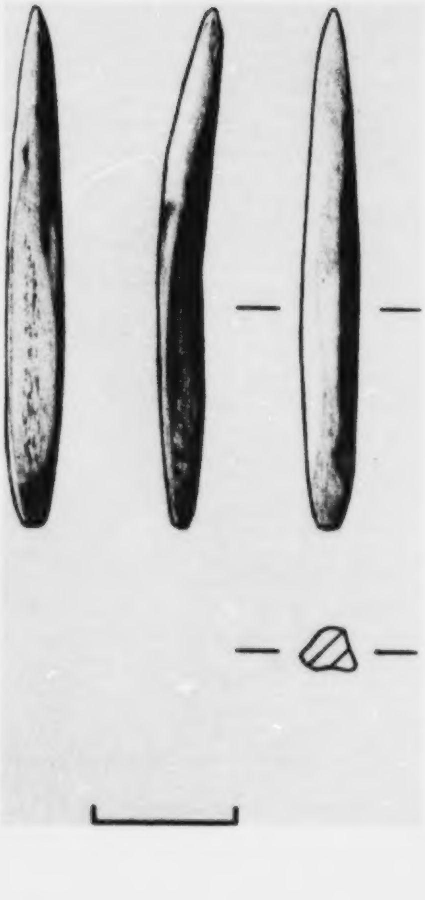


Figure 201. Miscellaneous point (1T2N2-1985). (Scale for Figs. 200-202: 0-2 cm.)

Hunting with Arrows

The use and original shape of the arrow point artifacts have been inferred from their similarity to Nootkan arrow points collected and described ethnographically. Respondents, when shown the more complete specimens, could not identify them.

Several 18th century European visitors to Yuquot noted that arrow points were barbed and made of shell or bone (Bayly ms., Burney n.d.: 33, Ellis 1783: 223; Samwell in Beaglehole 1967: 1101-1102). Cook observed that "most commonly their [arrow] points were of indented bone" (1785: 325), which suggests that the points were multibarbed. Webber's painting of a man at Nootka Sound in 1778 (see Drucker 1965: 39) and an unpublished Webber sketch of hunters at Yuquot depict long, thin unilaterally multibarbed arrow points protruding from quivers. A sketch by Colnett (Public Records Office, London: Adm 55/146, p. 125) shows an arrow tipped with a unilaterally multibarbed point, with the barbs closely spaced together.

These 18th century observations are confirmed and elaborated by 20th century ethnography:

> Anciently, the long cylindrical bone points, unilaterally or bilaterally barbed, were used for sea otter. For land game, and for war, thin wide points of bone and shell were loosely mounted to the arrow shafts (Drucker 1951: 32).

Of the various Nootkan hunting and fishing implements known ethnographically, only arrows have thin unilaterally multibarbed bone points.

The Nootkan ethnographical collections examined contained only a few bone-tipped arrows. They were characterized by two or three widely spaced low unilateral barbs. The proximal end which fitted into the arrow shaft was a long, pointed tang. The points had no incised, sawed or punctate decorative elements.

Thirty-seven, mostly incomplete, artifacts are believed to have been arrow points. Three general classes with some temporal proveniences are apparent. Thin, wide points, perhaps equivalent to Drucker's ethnographical category quoted above, may occur in all four zones, but a larger sample is required to demonstrate this. Points with many closely spaced unilateral barbs are found in Zone II and the lower to middle levels of Zone III. These points appear to be earlier versions of the long cylindrical unilaterally barbed points used historically for sea otter. The third class, points with few widely spaced unilateral barbs, occurs in the upper levels of Zone III and in Zone IV. These points share most attributes with those on arrows in Nootkan ethnographical collections and are likely the long bone points used for sea otter.

A fourth descriptive group, other unilaterally barbed points, includes several specimens too fragmentary for identification regarding class.

Thin Wide Points

Three bone points are grouped here because they broadly fit the ethnographic description of arrow points for land game and for warfare: "thin wide points of bone and shell," loosely mounted to arrow shafts so they would work about in the body of a wounded animal and cause internal injury (Drucker 1951: 32). No arrow points fitting this description were seen in the ethnographical collections studied.

A distinctive point from Zone Ib has been made from split, very dense land mammal bone (Fig. 202). In outline the point is long and triangular with a short stem. The sides of the blade are straight. The blade sides are bevelled on one face to form a sharp edge. The other face is ground flat, except for the remains of a marrow channel. The narrow, rounded shoulders project 3 and 5 mm from the stem, and are 18 mm across. In cross section the blade is almost plano-convex, and the stem, thin and rectangular. The stem tapers slightly inward to a straight base. The stem is 13 mm long, 2 to 3 mm thick and 6 mm wide at the base. Except for a broken tip, the point is complete. It was originally slightly longer than 66 mm.

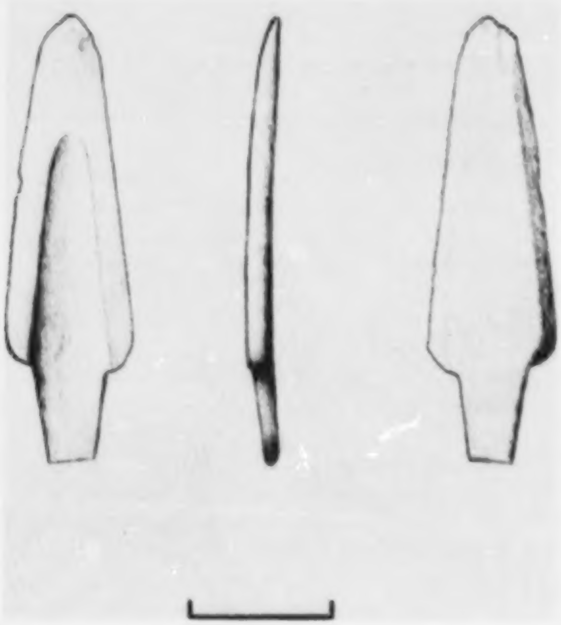


Figure 202. Stemmed point of land mammal bone (1T2F27B-2475) from Zone Ib.

A spade-like stemmed point of split birdbone (Fig. 203j) was recovered from the middle levels of Zone IIa. The asymmetrically excurvate blade edge is 3 mm thick and ground sharp with bevels on both faces. The shoulders are wide and rounded. They are 15 mm across, and extend 3 mm from the stem. The cross section of the blade and stem is slightly concavo-convex due to the natural curvature of the split bird bone. Both the stem and base are straight. The stem is 18 mm long, 8 mm wide and 3 mm thick. The base is 7 mm wide. The complete point is 48 mm long.

The third point, from the lowest levels of Zone IIIb, is roughly triangular in outline and stemless (Fig. 203i). Blade edges are straight and ground sharp with bevels on both faces. The cross section is lenticular. The base is straight, with truncated corners. Each face has been ground obliquely for about 12 mm above the base to make the basal portion slightly wedge-shaped. The point is 49 mm long, 13 mm wide and 4 mm thick.

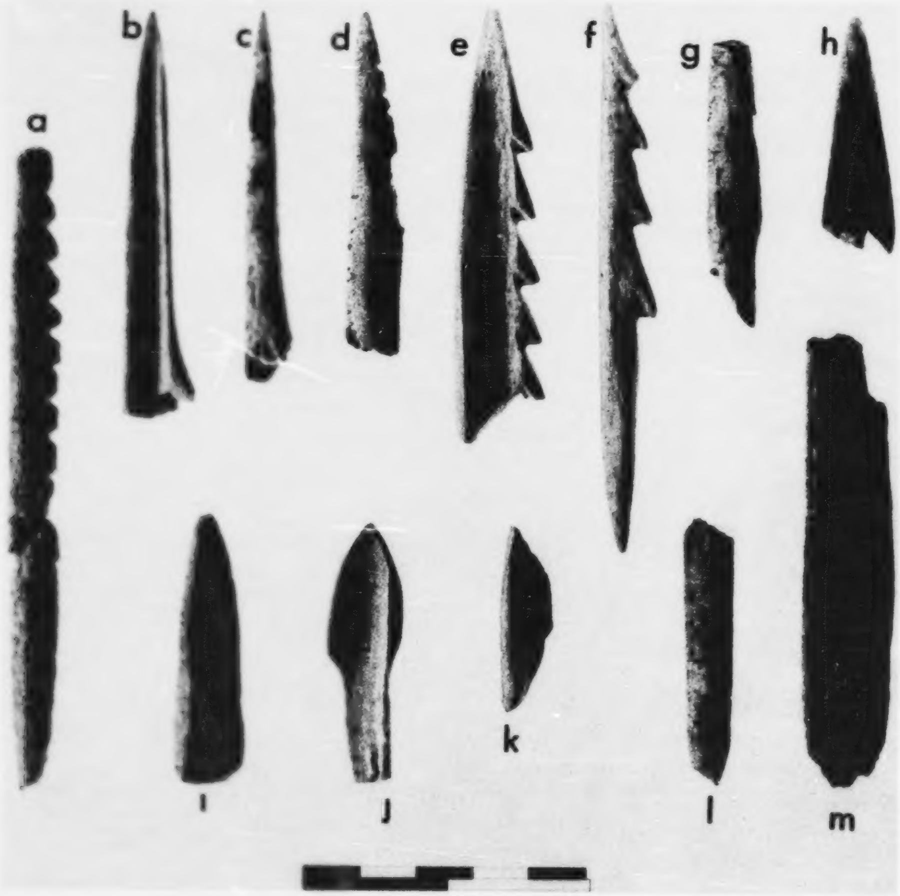


Figure 203. Arrow points. Points with many closely spaced unilateral barbs: a, 1T1C20A-1084; d, 1T3A12A-867x; e, 1T2D12-2361; f, 1T2D15A-2405; k, 1T2G9-3399x. Other unilaterally barbed points: b, 1T3C18A-870; c, 1T2A17-826; g, 1T1B19-802; h, 1T1E25-2443; l, 1T2C23-5388x; m, 1T2C8-2887x. Thin wide points: i, 1T2L9-2130; j, 1T2H13A-2338. (Scale for Figs. 203-205: cm, in.)

Points with Many Closely Spaced Unilateral Barbs

Sixteen mostly fragmentary bone points (Figs. 203, 204; Table 66), from Zones II and III, are characterized by many closely spaced unilateral barbs. Most barbs are "enclosed" (Drucker 1943: 36-37) and appear too low to be functional. The barb shapes, however, vary somewhat. Some are so slight that they must have been purely decorative. Others are "decorated" with rough saw grooves. The points are subgrouped, when possible, according to barb styles.

Four tips (Fig. 204e,f,g), a tang (Fig. 204j) and a body fragment (Fig. 203k) all have poorly defined low enclosed barbs. They are short indentations sawed into the thin side of the point, with saw grooves continuing diagonally on both faces. The body fragment also has five

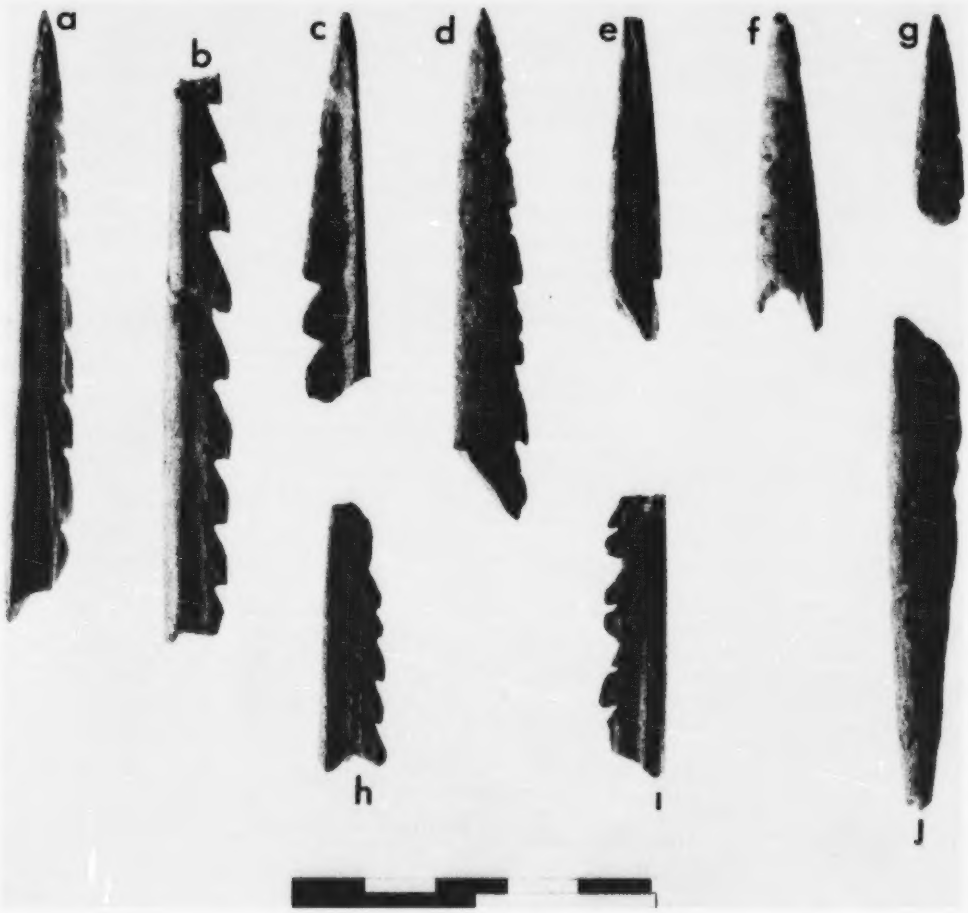


Figure 204. Points with many closely spaced unilateral barbs: a, 1T1X1-3024; b, 1T1A10-403; c, 1T2B11-3549x; d, 1T1X1-3047; e, 1T3A19-2804x; f, 1T1X1-3212x; g, 1T1X1-741x; h, 1T1L9A-2542; i, 1T3A11-3554x; j, 1T1C18B-886.

shallow saw notches across the edge of the barb. The end of one tip is decorated with a longitudinal saw groove (Fig. 204f). Sides of the four tips form angles between 10 and 15°. Cross sections are lenticular or roughly wedge-shaped, with barbs on the thin edge. The tang was originally longer than 44 mm.

Four points (Fig. 204a,b,c,h) have low enclosed barbs which probably projected far enough from the side to have been functional. One nearly complete point has nine well-defined barbs set off by a fine saw groove across their bases (Fig. 204a). The body is almost wedge-shaped in cross section, with the barbs in the thin edge. The proximal end, which may have terminated in a short pointed tang, has broken away. Sides of the distal tip form an angle of nearly 15°. Maximum thickness is 4 mm. When intact, the point was longer than 88 mm. The other three points are less complete. One is a large body fragment with a wedge-shaped cross section and nine barbs (Fig. 204b). Another consists of a distal tip with three barbs and sides forming an angle of 10° (Fig. 204c). The fourth is a small body fragment, almost tear shaped in cross section with the barbs along the narrow side (Fig. 204h).

Table 66. Points with Many Closely Spaced Unilateral Barbs: Provenlences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Maximum Thickness	Tang Length
IIId	1T1A10-403	82+	5	-*
IIIc	1T3A11-3554x	frag.	5	-*
IIIc	1T3A12A-867x	62+	5	-*
IIIc	1T2B11-3549x	56+	6	-*
IIIc	1T2D12-2361	79+	6	-*
IIIc	1T2D15A-2405	100	6	36
IIIb	1T2G9-3399x	frag.	4	-*
IIIa	1T1C18B-886	tang	6	44+
IIa	1T3A19-2804x	tip	4	-*
IIa	1T1C20A-1084	113+	8	38+
IIa	1T1C22-1095x	tip	6	-*
IIa	1T1L9A-2542	frag.	5	-*
no provenience	1T1X1-741	tip	3	-*
	1T1X1-3024	88+	4	-*
	1T1X1-3047	74+	5	-*
	1T1X1-3212	tip	5	-*

* Incomplete.

Two points have tear-shaped cross-sections and enclosed low barbs similar to those described above, but the barbs are notched across the outer edge. On one body fragment a single deep saw groove cuts each barb across the middle (Fig. 204i). On the distal half of a point, a shallow saw groove cuts across each barb at the beginning and in the middle (Fig. 204d).

A distal portion of a point of sea mammal bone has been "barbed" only near the piercing area of tip (Fig. 203d). The barbs are merely several shallow saw notches across the narrow edge of the tip. The sides of the tip form an angle of 15°.

A nearly complete whalebone point, from the upper levels of Zone IIa, has 11 cog-like, low, enclosed barbs made by sawing at right angles across the side (Fig. 203a). The cross section varies from almost round to nearly tear-shaped. The tang probably ended in a point. The artifact is 8 mm thick, and was originally more than 115 mm long.

A large fragmentary point of land mammal bone (Fig. 203e), from Zone IIIc, is larger than the other points described here, but is included because of its general attributes and barb shape. The larger proportions suggest that the artifact may have originally been part of a harpoon head, but this cannot be determined with the proximal end missing. The distal sides form an angle of about 20°. The cross section is thin and nearly rectangular, except for one face which still bears the remains of a bone cavity. The barbs are high and enclosed, with tips and outer edges ground flat.

The only intact point (Fig. 203f), from Zone IIIc, is made of sea mammal bone. It has four isolated barbs that project well and therefore were probably functional. The point is tear-shaped in cross section, with barbs on the thin edge. The tang, 36 mm long, is almost square in cross section. Its sides taper to a point of 15°. Sides of the distal tip form a 15-20° angle. The point is 100 mm long and 6.5 mm thick.

Points with Few Widely Spaced Barbs

Nine distinctive unilaterally multibarbed bone points (Figs. 205, 206, 207; Table 67) were recovered from the upper levels of Zone III and Zone IV. The points have two, at the most three, widely spaced barbs. They are enclosed on five specimens, and probably too low to be functional. Barbs on the other points are isolated, and project more, but probably not enough to have been functional. Decoration of the barbs is virtually absent; a fragmentary point with a long, low enclosed barb bears a fine saw groove along the base of the barb, parallel to the barb edge (Fig. 205f).

The body cross sections are rectanguloid on five points, tear-shaped on two and trianguloid on one.

Six relatively complete points have pointed tangs. The tangs on five points are set off from the body by a slight shoulder on the barbed

Table 67. Points with Few Widely Spaced Unilateral Barbs: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Maximum Thickness	Tang Length	Fig. No.
IVa	1T3A3A-3788x	57+	6	-*	205d
IVa	1T1B5-5322x	frag.	-*	-*	
IVa	1T2E4-1242	101+	5	26	205a
IVb	1T1J5-1706	66+	7	21+	205f
IVb	1T1K5C-1498	100	4	40	205b
IIIb	1T2K7-3516x	79+	5	-*	
IIIc	1T1F7-1258x	72+	5	26	205e
IIIc	1T2F7B-1826	106	6	25+	
no provenience	1T2A-5488x	59+	6	-*	205c

* Incomplete.

side (Fig. 205a,b,d,e,f). The tang cross sections are rectanguloid in cross section on four artifacts, and oval on two. Complete or nearly complete tangs from shoulder to tip range from 26 to 40 mm long.

Most specimens are too incomplete to make meaningful general statements about dimensions (Table 67). Three relatively complete points range between 100 and 110 mm long, and 4 to 6 mm thick.

The points, all from very late prehistoric and historic period deposits, strongly resemble bone points on Nootkan arrows in ethnographical collections (cf. BCPM Cat. No. 6166; NMM Cat. No. VII F 218). These points have three low enclosed unilateral barbs and a pointed tang. The ethnographical points, however, are about 50 mm longer than the archaeological ones.

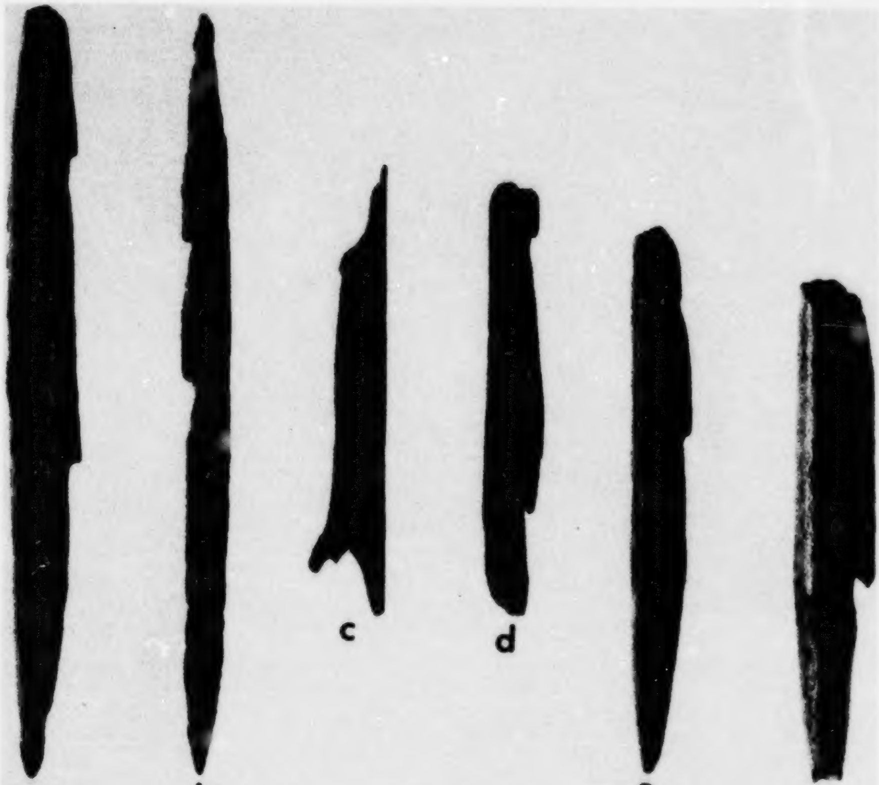


Figure 205. Points with few widely spaced barbs: a, 1T2E4-1242; b, 1T1K5C-1498; c, 1T2A-5488x; d, 1T3A3A-3788x; e, 1T1F7-1258x; f, 1T1J5-1706.

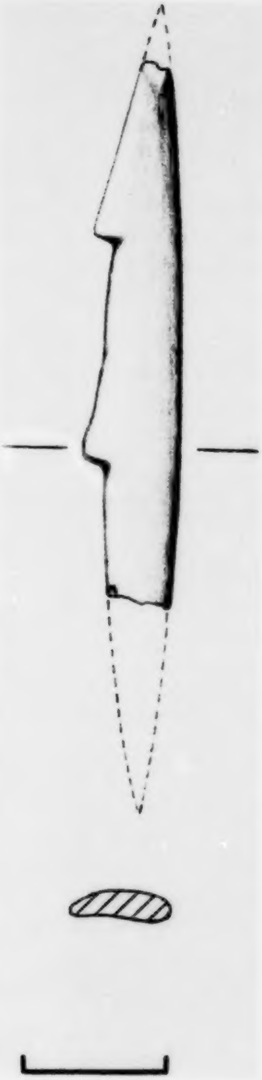


Figure 206. Point with few widely spaced barbs (1T2K7-3516x). (Scale for Figs. 206-209: 0-2 cm.)

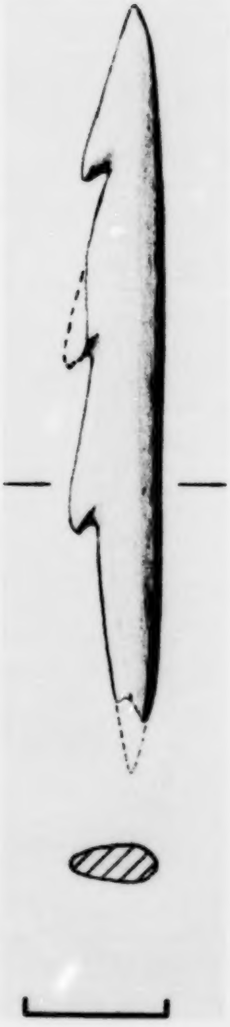


Figure 207. Point with few widely spaced barbs (1T2F7B-1826).

Other Unilaterally Barbed Points

Nine artifacts described below are too fragmentary for classification into the above categories. Similarity of these artifacts to those described above suggests a like function.

Four calcined, warped whalebone artifacts from the upper levels of Zone Ib are tips of unilaterally barbed points. Two, 1T1E25-2443 (Fig. 203 h) and 1T1E25-2447x, have broken off just behind the first barb. The barbs are high and enclosed. The sides of the points form an angle of 15°. The points are lenticular in cross section. Both have a maximum thickness of 5.5 mm. The other two calcined points, 1T1E25-2441 and 1T1E25-2444, are too fragmentary to merit description.

Two artifacts from the upper levels of Zone IIa are long narrow points with the first barb more than 55 mm from the tip (Fig. 203b,c). The whalebone point has broken away at the barb. Its complete barb (Fig. 203b) is high and isolated with a rounded tip. Distal sides of the points form an angle of approximately 10°. Maximum thickness is from 4 to 5 mm.

One land mammal bone artifact from the uppermost level of Zone IIa appears to be a fragment of an uncompleted unilaterally barbed point (Fig. 203g). The side has been sawed to make a low, completely enclosed barb. The artifact is rectanguloid in cross section. It is 52 mm long, 10 mm wide and 7.5 mm thick.

Two barbs, 1T1X1-3026 and 1T2C11-2904x, were recovered without provenience and from Zone IIIc, respectively. They had broken from points, and are too small to merit description.

A large wedge-based tang of whalebone (Fig. 203m), presumably from either an arrow point or the arming point of a composite harpoon head, was recovered from Zone IIId. An indentation in one side near the broken end suggests that the artifact was originally unilaterally barbed. The tang is rectangular in cross section, and slightly wedge-shaped in side view. The artifact is 82 mm long, 16 mm wide and from 3.5 to 6 mm thick. Reddish brown stains on the tang suggest that it was inserted in a wooden shaft.

A fragmentary whalebone artifact (Fig. 203l) from Zone IVd is likely the tang of an arrow point. One end is asymmetrically pointed. The cross section is tear-shaped. The artifact is 49 mm long, 9 mm wide and 6 mm thick.

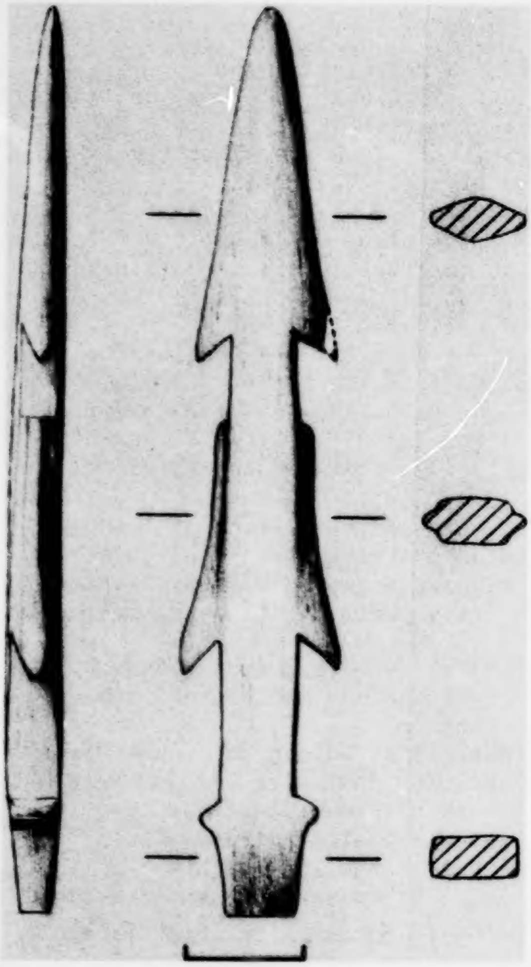


Figure 208. Bilaterally barbed male harpoon head (1T1H16-2128). Whalebone.

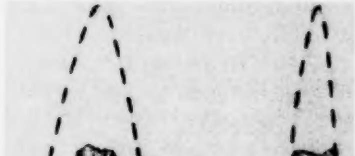


Figure 209. Bilaterally barbed male harpoon head (1T2H16-2277). Whalebone.

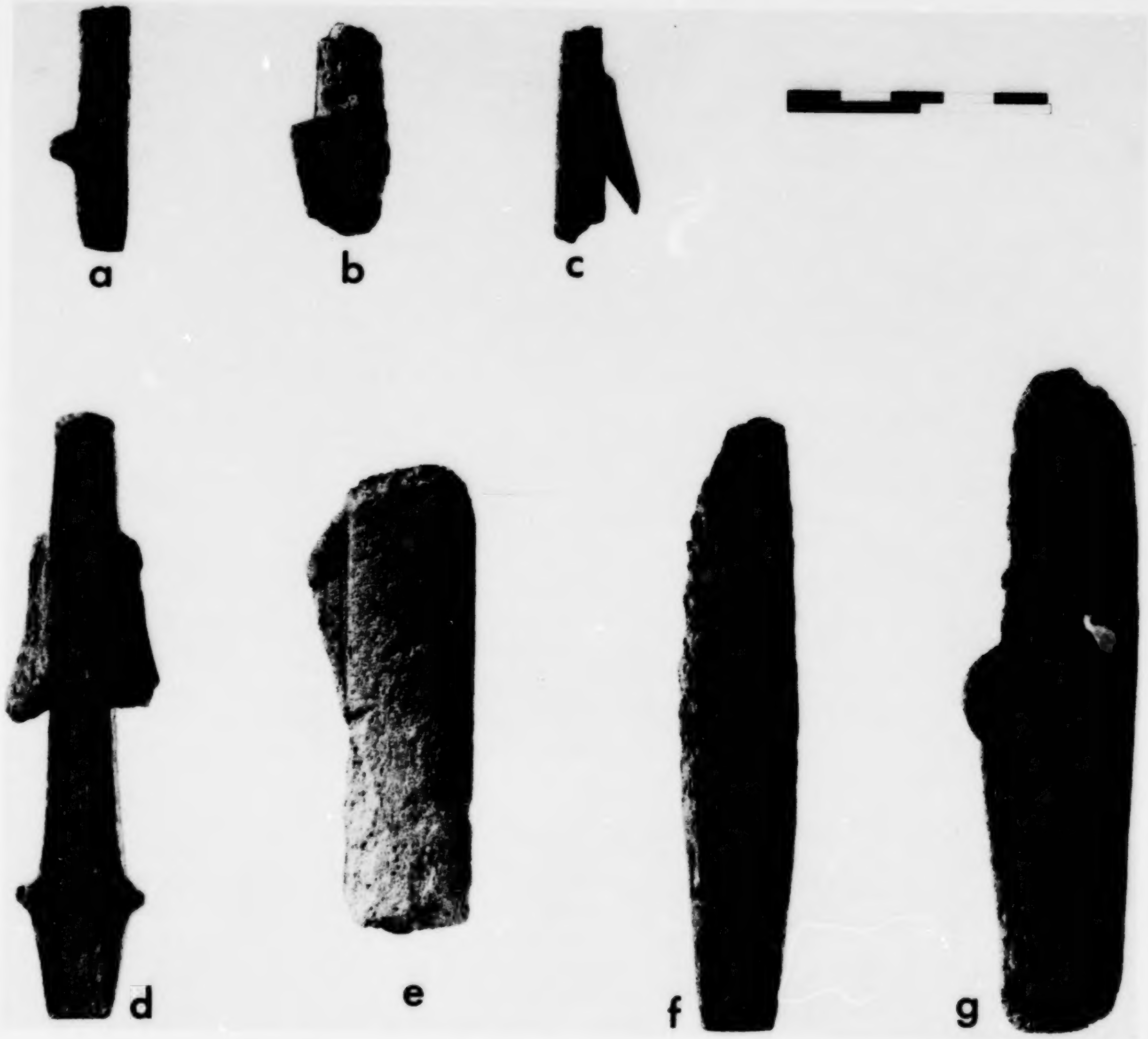


Figure 210. Male harpoon heads of whalebone: a, calcined tang and body fragment with unilateral line guard (1T1H16-2131); b, possible tang fragment (1T3B2B-2852x); c, body fragment with unilateral barb (1T1A25A-1575); d, bilaterally barbed head with opposing bilateral line guards (1T1J14-2434); e, body fragment with unilateral barb, possibly of large multibarbed head with line hole (1T1A21-2722x); f, fragment, possibly of uncompleted small head with rectangular or trapezoidal tang (1T1L8A-2546); g, fragment, possibly of uncompleted large unilaterally multibarbed head with line hole (1T1L8A-2545). (Scale: cm, in.)

Hunting with Harpoons

Hunting with harpoons is represented by 29 artifacts, mostly harpoon heads. They can be separated by operating principle into two broad classes: male and female. These classes of harpoon heads used for sea mammal hunting follow a cultural sequence, with male heads being replaced by female heads.

The male heads are single-piece, non-toggling and unilaterally or bilaterally barbed. They have a tang which fitted into a socket or similar accommodating device on the harpoon shaft (Mason 1902: plate 2), hence the "male" principle. Three classes of male heads occur at Yuquot: bilaterally barbed heads, unilaterally barbed heads with shouldered tang and large unilaterally multibarbed heads with line holes. The first two classes were found in Zone II; the third in the lowest levels of Zone IIIc.

The female heads toggled and were therefore probably more effective than the male heads. The female heads are composite, consisting of two matched valves which formed a slot for a cutting blade at one end and two outward turning barbs at the other. Two matched grooves between the barbs formed a socket for the harpoon foreshaft; hence, the "female" principle. The only parts of the female heads remaining are the whalebone and antler valves. Large simple valves appear to be from an early variety of whaling harpoon head. These may appear in Zone III. Slotted valves like those of historically known toggle heads for sea mammal hunting occur in Zones III and IV.

Three artifacts related to hunting with female heads were also recovered: a unilaterally barbed arming point, a possible slate arming blade and a probable uncompleted finger grip.

Bilaterally Barbed Harpoon Heads

Three remarkably similar bilaterally barbed whalebone harpoon heads with opposing bilateral line guards (Figs. 208, 209, 210d; Table 68) were recovered from the middle levels of Zone IIa in the east half of the trench. The proximity of these artifacts to a dated firepit and nearby levels suggests an age of 2000 years.

All three heads have a short trapezoidal tang. The base of the tang is flat or slightly excurvate, and rectangular in end view. The faces of the tang slope gradually inward toward the base. Two opposing bilateral line guards project from 4 to 5 mm from the body. The body, where it does not join the barbs, is rectangular in cross section. The barbed point is lenticular in cross section. The point has straight sides which end in two small opposing barbs; they are triangular in cross section and form a 45° angle with the body of the harpoon head. The second barbs on two heads are long, single, isolated and opposing. The smallest harpoon head (Fig. 209) does not have a second set of barbs, but originally had a bilaterally barbed point similar to the one on the complete head. All surfaces on the artifacts are ground flat and smooth. Dimensions of all three heads, particularly of the tangs, are remarkably similar (Table 68).

Table 68. Bilaterally Barbed Harpoon Heads: Dimensions (mm)

Artifact No.	Length	Width at Line Guards	Thickness at Line Guards	Tang Length	Tang Width Below Guards	Base Width	Base Thickness	Fig. No.
1T1H16-2128	162	21	9	15	16	12	5	208
1T2H16-2277	71+	22	8	15	16	12	5	209
1T1J14-2434	119+	26	10	19	19	12	5	210d

Unilaterally Barbed Heads with Shouldered Tang

A distinctive harpoon head of whalebone, with unilateral barbs, a single shouldered tang and rectanguloid cross section is represented by four artifacts (Figs. 211-214; Table 69). They occur in Zone IIa and in the lowest levels of Zone IIIc.

The tang in outline is more or less an elongated trapezoid. The base is flat or slightly rounded. The sides of the tang expand slightly from the base. One side is a continuation of the unbarbed side of the harpoon head. The other side of the tang forms a shoulder line guard on the barbed side of the head. The shoulder on one specimen (Fig. 214) also forms part of an encircling line groove 5 mm wide and 2 mm deep. The tangs are rectanguloid in cross section. The tang and shoulder dimensions are remarkably similar (Table 69).

Table 69. Unilaterally Barbed Heads with Shouldered Tang: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Maximum Thickness	Width at Shoulder	Thickness at Shoulder	Tang Length	Base Width	Base Thickness	Fig. No.
IIIc	1T1D18A-2598	125	11	17	11	26	10	6	214
IIa	1T3B22A-1114	183+	11	20	11	41	14	5	211
IIa	1T2H18B-2389x	-*	-*	18	11	28	15	6	213
IIa	1T2H20B-2449	136+	9	20	8	27	-*	3	212

* No data.

The nearly intact heads have two unilateral isolated barbs. The barbs on one head (Fig. 211) are triangular in cross section; the distal half of the second barb is set off from the body like the barbs on the bilaterally barbed heads with opposing line guards. On another head, the barbs are shallow with almost no tip (Fig. 212).

Only two artifacts have nearly intact points. One is lenticular in cross section (Fig. 211). The other is rectangular in cross section, with a chisel-shaped tip (Fig. 214).

The unilaterally and bilaterally barbed male harpoon heads suggest a reported "ancient type" of sealing harpoon head: "a dartlike implement with a slender bone point with a row of barbs down one (or two?) sides. This point was detachable, being secured to the shaft by a short lanyard" (Drucker 1951: 27).

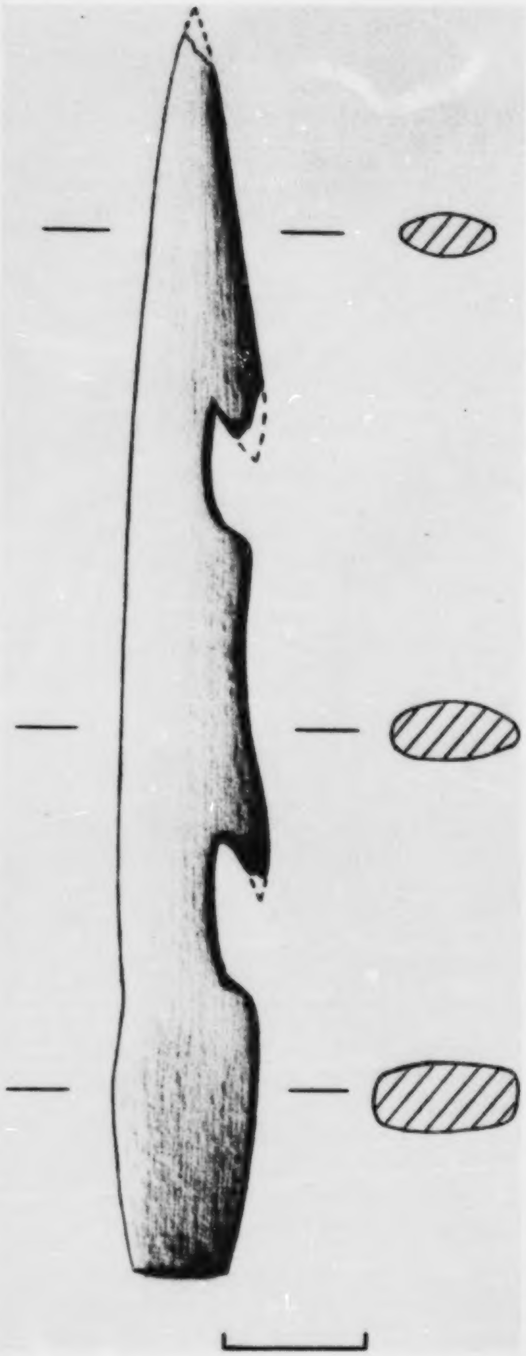


Figure 211. Unilaterally barbed male harpoon head with shouldered tang (1T3B22A-1114). Whalebone. (Scale for Figs. 211-214: 0-2 cm.)

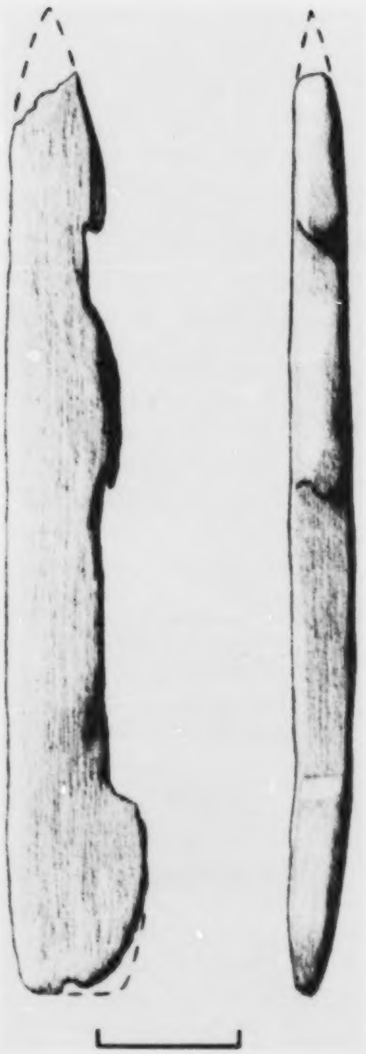


Figure 212. Unilaterally barbed male harpoon head with shouldered tang (1T2H20B-2449). Whalebone.

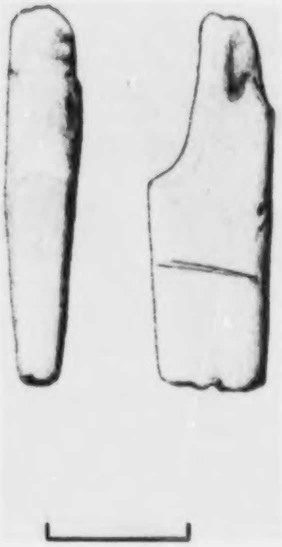


Figure 213. Shouldered tang fragment of unilaterally barbed male harpoon head (1T2H18B-2389x). Whalebone.

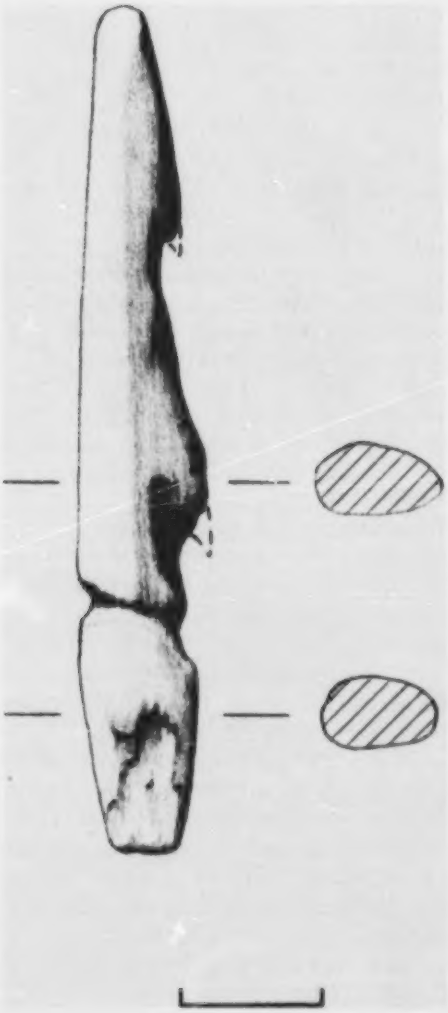


Figure 214. Unilaterally barbed male harpoon head with shouldered tang and line groove (1T1D18A-2598). Whalebone.

Large Unilaterally Multibarbed Heads with Line Holes

Two large unilaterally multibarbed whalebone harpoon heads with line holes may represent a distinctive type. In addition, a large body fragment may have originally been such a harpoon head.

A complete head (Fig. 215) from the lowest levels of Zone IIIc is 301 mm long. On one side are three isolated barbs followed by a barb-like projection enclosing a biconical line hole. In cross section, the distal portion before the first barb is rectanguloid; the barbed and line hole portion is tear-shaped with a blade-like barbed edge; and the tang at the proximal end is rectanguloid. The widest and thickest part of the artifact, 34 by 14 mm, is just below the line hole. The oval line hole measures 6 by 5 mm. The tang is 62 mm long. It gradually tapers to a flat base 8 by 4 mm. All surfaces are ground and polished.

A fragmentary head without provenience (Fig. 216) has a line hole and tang similar to the above. The tang, roughly rectanguloid in cross section, appears unfinished. The section of the tang that merges into two opposing shoulders measures 20 mm wide and 14 mm thick. The shoulders are 37 mm wide and 19 mm thick. A U-shaped recess between the shoulders on both faces contains a biconical line hole 4 mm in diameter.

A fragmentary body portion with barb (Fig. 210e), from the middle levels of Zone IIa, may have once belonged to a large unilaterally multibarbed head. The barb was originally isolated. The artifact is tear-shaped in cross section, with the barbed side flat or rounded. The artifact is 12 mm thick.

Two respondents, when shown the complete harpoon head, claimed it was used only for large sharks, such as the basking shark. The respondents likely confused the harpoon head with the barbed arming points of composite female toggling heads used for sealing and for large sharks in the late 19th century. Other respondents stated that they had never seen harpoon heads of the male type and surmised that on the basis of size, the male heads were used for seal hunting.

Other Male Harpoon Heads

Eight artifacts are either male harpoon heads that do not readily fit into the above described classes, or probable fragments of male heads.

A complete artifact of very dense land mammal bone, from Zone Ib, appears to be a modified harpoon head (Fig. 217). The proximal end consists of a trapezoidal tang which forms opposing shoulders on each side of the artifact. The shoulders appear to have served as line guards. The sides and faces of the tang taper inwards to form a slightly curved base. The tang is rectangular in cross section. It is 6 mm thick and 20 mm wide at the shoulders; the base is 3 mm thick and 14 mm wide. These dimensions are consistent with those of the tangs of the unilaterally and bilaterally barbed heads (cf. Tables 68, 69). Both faces of the tang bear chips from chopping or whittling. The distal end of the artifact appears to have been reworked into a sharp wedge-shaped point. The cross section near the point is rectanguloid and 6 mm thick.

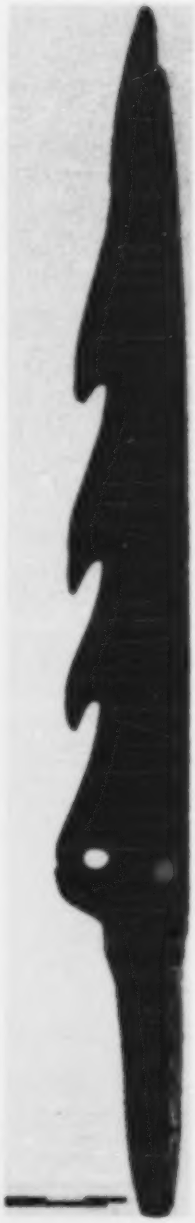


Figure 215. Complete large unilaterally multibarbed male harpoon head with line hole, 1T2E13-1961, from base of Zone IIIc. Whalebone. (Scale: cm, in.)

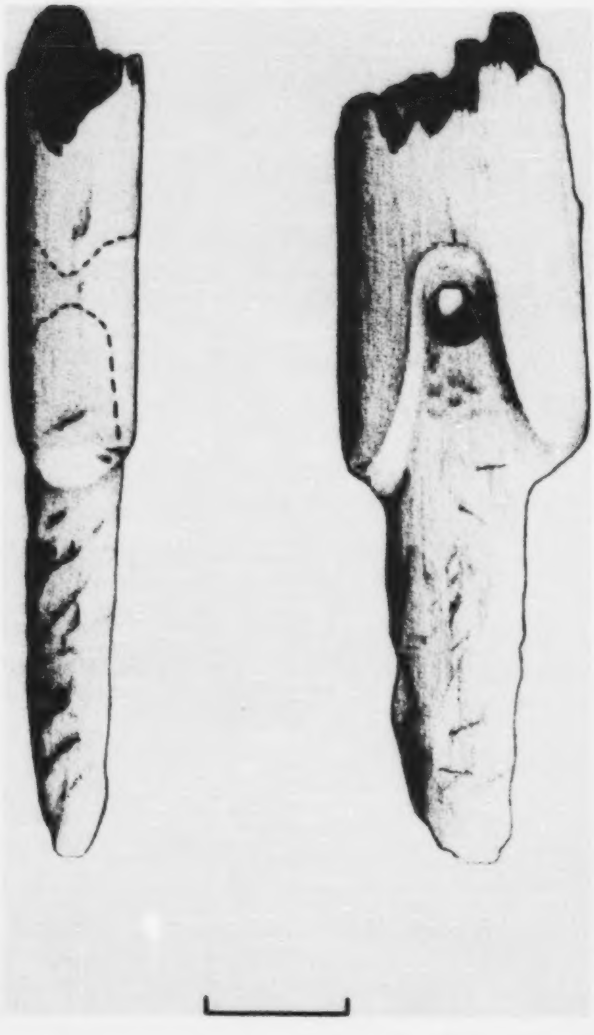


Figure 216. Tang and body fragment of large male harpoon head with line hole (1T1X1-3196). Whalebone. (Scale for for Figs. 216-219: 0-2 cm.)

The artifact is 76 mm long. It is likely a reworked male harpoon head similar to the distinctive bilaterally barbed type with trapezoidal tang.

A whalebone body portion and tang with unopposing bilateral line guards (Fig. 218) was recovered from Zone IIb. The line guards project 3 - 4 mm from the body. The tang is unusually short, only 8 mm from the lowest line guard to the base. The base is asymmetrically rounded in outline, and measures 31 mm wide by 4 mm thick. In side view the tang is asymmetrically wedge shaped, with one flat face, and the opposite face turning inward at the base. Cross section is rectangular.

A complete small head of land mammal bone (Fig. 219) was found in Zone IIa. The tang is nearly square in outline. The base, 14 mm wide by 3 mm thick, was once ground flat. The tang is 13 mm long from the base to a slight shoulder which served as a line guard. The single barbed point is isolated and nearly triangular in cross section. The

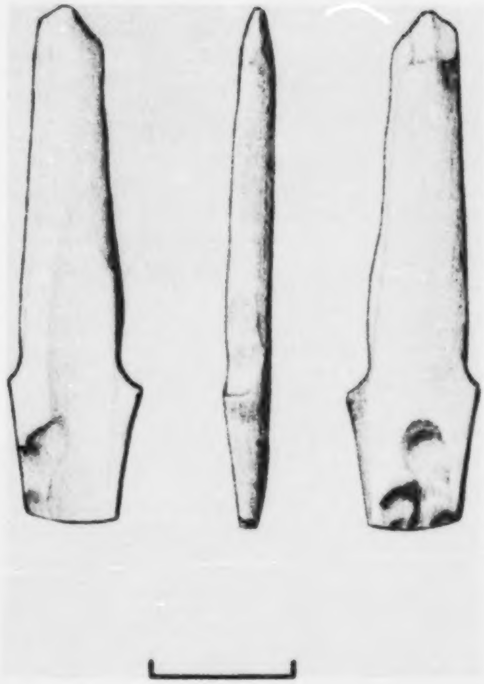


Figure 217. Probable reworked bilaterally barbed male harpoon head from Zone Ib (1T3A27A-1584x). Land mammal bone.

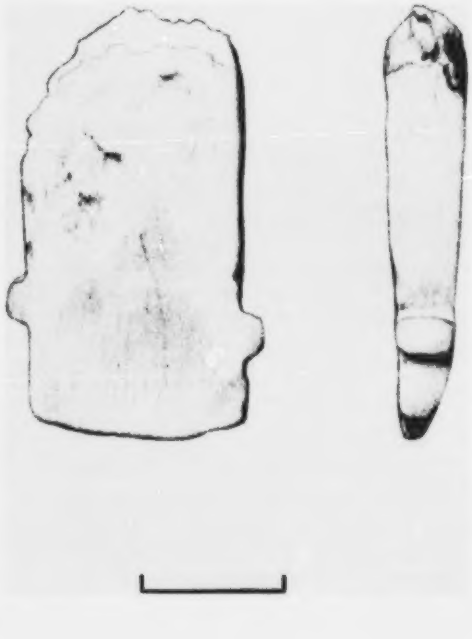


Figure 218. Tang and body fragment of male harpoon head with unopposing bilateral line guards (1T1J11-2380). Whalebone.

tip has broken away. The artifact is 67 mm long, 13 mm wide at the shoulder and 5 mm thick at the shoulder.

A partly calcined proximal portion of a small whalebone head with a unilateral line guard (Fig. 210a) was recovered from Zone IIa. The line guard projects 5 mm from the body. The rectangular tang is 15 mm long. Its flat base measures 8 mm wide and 3 mm thick. Both the body and tang are rectangular in cross section. The artifact is 16 mm wide and 6 mm thick at the line guard.

A whalebone body portion with barb (Fig. 210c) from Zone IIa likely came from a small unilaterally barbed head. The barb is isolated, and stands out from the body like those of the bilaterally barbed heads. It is also triangular in cross section and joins a flat side. Both faces are ground flat, and the unbarbed side is rounded. The proximal end is 8 mm thick.

Two whalebone artifacts from Zone IIIb appear to be fragments of uncompleted male heads. One may have been intended as a large unilaterally multibarbed head with line hole (Fig. 210g), the other, a small head with rectangular or trapezoidal tang (Fig. 210f).

A badly eroded whalebone artifact from Zone IV (Fig. 210b) suggests either a harpoon head or spear point with a shouldered tang.

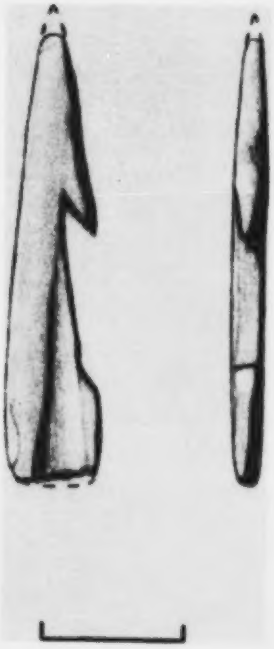


Figure 219. Small unilaterally barbed male harpoon head with shouldered tang (1T1B23B-1102). Land mammal bone.

Simple Valves of Composite Whaling Harpoon Heads

Two large valves that lack most refined attributes of the slotted valves appear to be a simplified form of whaling harpoon valve. These simple valves may represent a former type of whaling harpoon head from the early stages in the development of whaling.

An eroded, but mostly intact, whalebone valve (Fig. 220) was recovered without provenience. Unlike the slotted valves, this simple

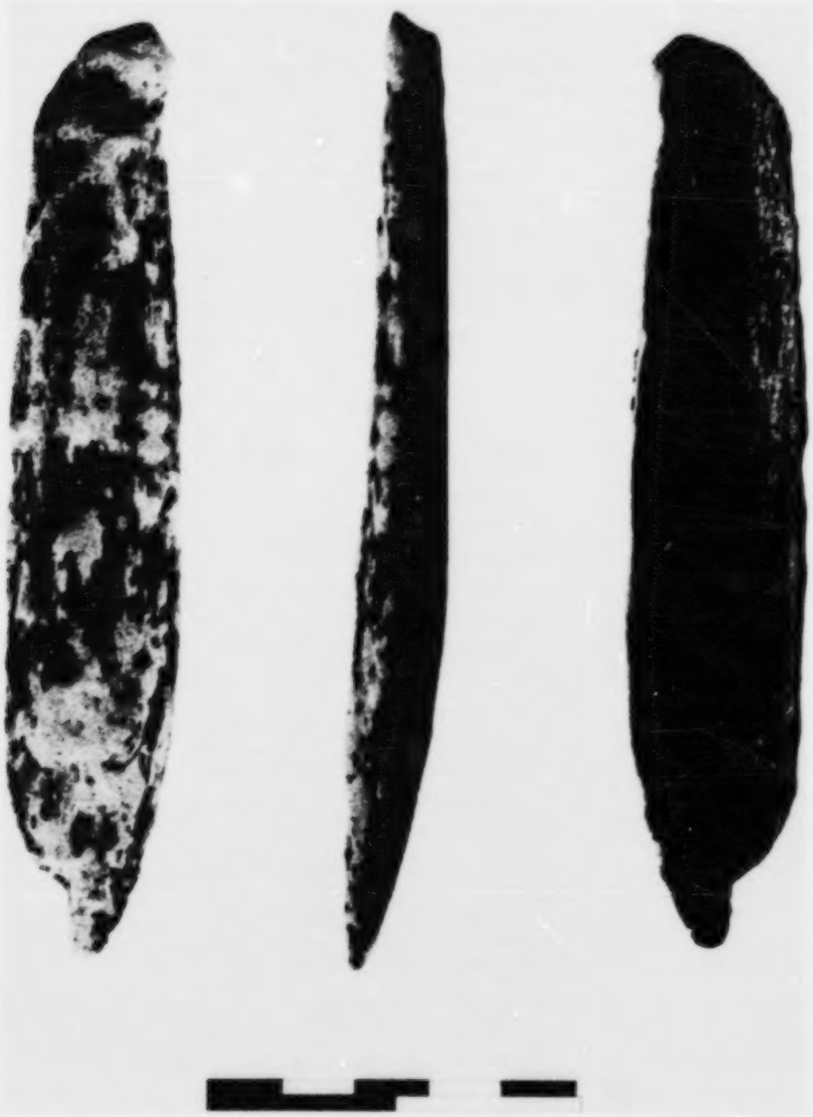


Figure 220. Simple valve of composite whaling harpoon head (1TIX1-2786): dorsal, lateral and ventral views. (Scale: cm, in.)

valve is concavo-convex in cross section for its total length. The narrow ventral edges, only from 2 to 5 mm wide, presumably served as a contact surface for the other matched valve. The deep concave ventral surface running the length of the valve(s) must have served as the foreshaft socket. The proximal end terminates in a rounded point with an upturned ventral face to form a barb. The outer face of the barb is eroded, but one can see remains of a punctate zigzag motif along the edge of the barb. Traces of another motif can be discerned on the dorsal face of the barb. The dorsal surface on the distal half of the valve bears several parallel transverse grooves imprinted by tight lashings. The distal end does not appear to have contained an insert platform that would form a slot blade with the other matched valve. There are suggestions of a distal ridge to facilitate lashing. The valve is 129 mm long, 25 mm wide and 13 mm thick. Its large size, punctate pattern found on historical whaling heads, barb and transverse lashing like those of known whaling heads suggest that the valve was likely part of a composite whaling head.

The second artifact (Fig. 221), from Zone IIIb, may be a reworked broken version in land mammal bone of the above. It is concavo-convex in cross section, with the ventral edge ground flat. One end is broken, but a rounded ground flat corner remains. The other end has been sawed nearly through transversely and then snapped off. The portion of the artifact removed by sawing was presumably reworked. The artifact is 32 mm wide and 12 mm thick.

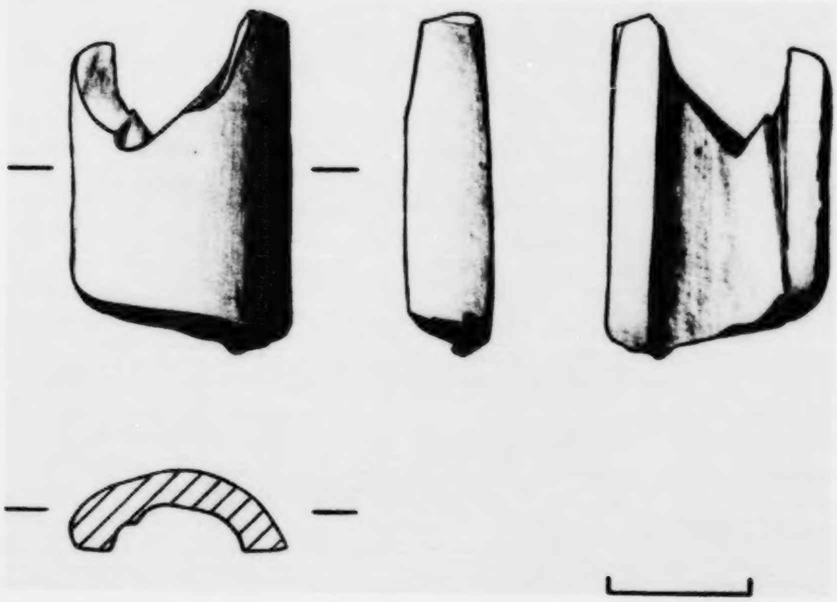


Figure 221. Possible fragment of simple valve of composite whaling harpoon head (1T1C10-3783x). Land mammal bone. (Scale for Figs. 221-227: 0-2 cm.)

Slotted Valves of Composite Toggle Heads

Seven valves of slotted composite toggle heads (Figs. 222-227; Table 70) were recovered from Zones IIIc and IVa. Only one of these artifacts is relatively complete. The others are either barb and foreshaft socket portions of the valve or the slotted tip into which a cutting blade was fixed. The large size of the barb and socket portions approximates those of complete slotted valves in ethnographic collections and thus enabled the fragmentary artifacts to be identified.

The valves are of sea mammal bone, except for two which are antler. The midventral face of the valves is ground flat to form a contact surface for its mate. At the widest part of the valve, the ventral face curves outwards and the sides taper to a pointed barb. The ventral face at the maximum width bears a deep oval-shaped groove which forms one-half of the foreshaft socket when the matched valves are fitted together. The valves are plano-convex in cross section. The distal tip tapers on the sides and dorsal surfaces to a rounded point. The ventral face of the tip is ground flat and set in. The two inset faces form a blade slot when the matched valves are mated. The sides and dorsal surfaces posterior to the blade slot cut sharply inward, leaving a slight ridge to facilitate lashing.

The seven valves are too few and too fragmentary to distinguish size and functional groupings. The largest valves, however, were probably for whaling. The barb of one bears the punctate zigzag motif (Fig. 222) often found on whaling heads in ethnographic collections. The incomplete valves were originally larger than those on whaling harpoon heads collected historically. Perhaps the smaller recent valves reflect greater refinement in whaling technology. The reduced valve size may be related to improved penetrating power of iron cutting blades adopted in the historic period.

The smallest and only complete valve (Fig. 227) was identified by three respondents as a salmon harpoon valve which originally had a cutting blade. During the excavation a respondent showed us a similar valve made within this century by a relative and explained that the valve was part of a composite salmon harpoon head. One respondent believed that the archaeologial valve was part of a sealing head. It would seem that small heads with cutting blades were used to take small sea mammals and large salmon. Slotted valves, but with wedge-based arming points, obviously for salmon, were recovered from Alberni (McMillan and St. Claire 1975: fig. 7a,b), but they are much smaller than the Yuquot valve.

The seven valves are essentially the same as those of historic period composite toggle heads of two matching valves forming a socket for insertion of the harpoon foreshaft and a slot for the cutting blade (cf. Waterman 1920: 33). Complete slotted composite heads in museum collections, especially one collected from Nootka Sound by Magee in 1792 (PM Cat. No. 262), indicate the wrappings and lashings on the artifacts (Fig. 228). The valves were lashed together, posterior to the distal ridge, with sinews braided into a leader for attachment to the harpoon line. The sinew lashings were then wrapped with wild cherry bark (Prunus emarginata Dougl.). A blade of ground California mussel shell was fitted into the blade slot and fixed with spruce gum. The cherry bark wrapping and adjoining sides of the blade were also coated with spruce gum.

Table 70. Slotted Valves of Composite Toggles Heads: Proveniences and Dimensions (mm)

Zone/Stratum	Artifact No.	Length	Width	Thickness	Slot Length	Slot Width	Length of Contact Area	Foreshaft Width	Socket Depth	Fig. No.
IVa	1T1A5-279	-*	-*	-*	31	21	-*	-*	-*	226
IIIc	1T3A9-268	90+	19+	10	-*	14	66	-*	-*	224
IIIc	1T3A11-333	74+	13	7	15+	10	28	8	3	227
IIIc	1T3C14A-841	-*	17	-*	-*	-*	-*	9	4	
IIIc	1T1E13-2302	77+	-*	8	21	12	-*	-*	-*	225
IIIc	1T1F8-1272	106+	31	16	-*	-*	-*	17	6	222
IIIc	1T2G8C-1510	95	29	11	-*	-*	-*	12	5	223

* No data.

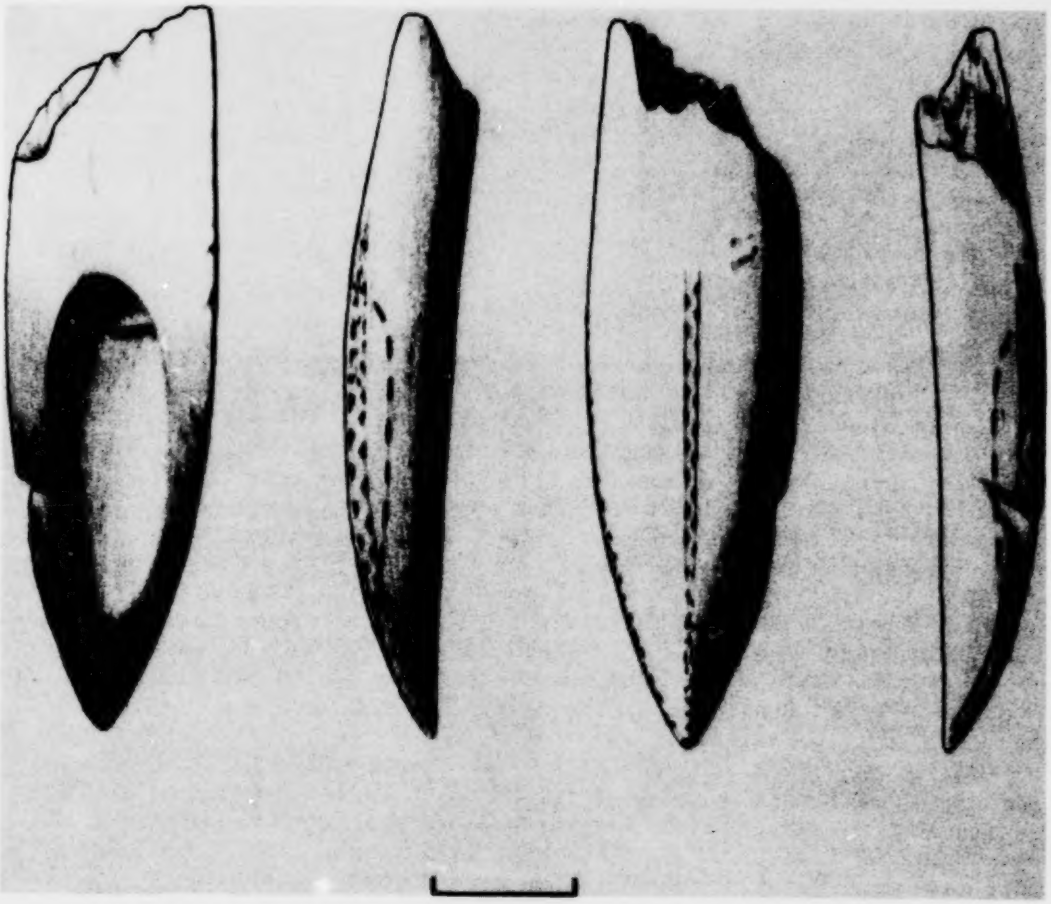


Figure 222. Fragmentary slotted valve of composite whaling harpoon head (1T1F8-1272). Whalebone.

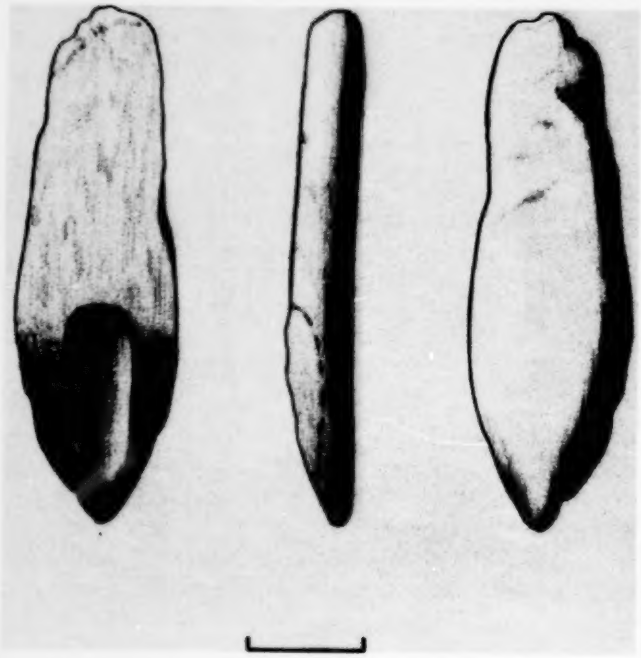


Figure 223. Fragmentary slotted valve of composite toggling harpoon head (1T2G8C-1510). Whalebone.

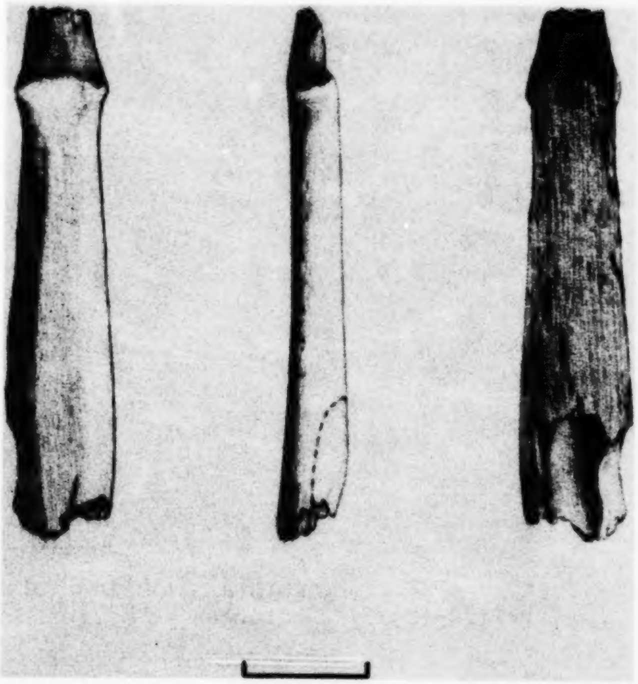


Figure 224. Fragmentary slotted valve of composite toggling harpoon head (1T3A9-268). Whalebone.

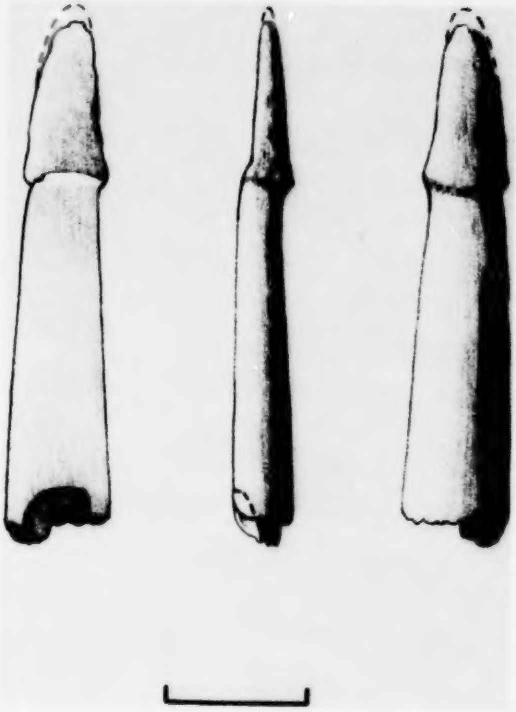


Figure 225. Fragmentary slotted valve of composite toggling harpoon head (1T1E13-2302). Whalebone.

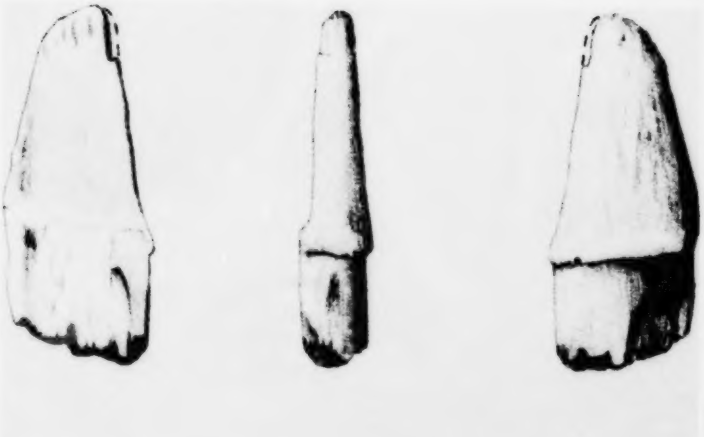


Figure 226. Distal fragment of slotted valve of composite toggling harpoon head (1T1A5A-279). Antler.

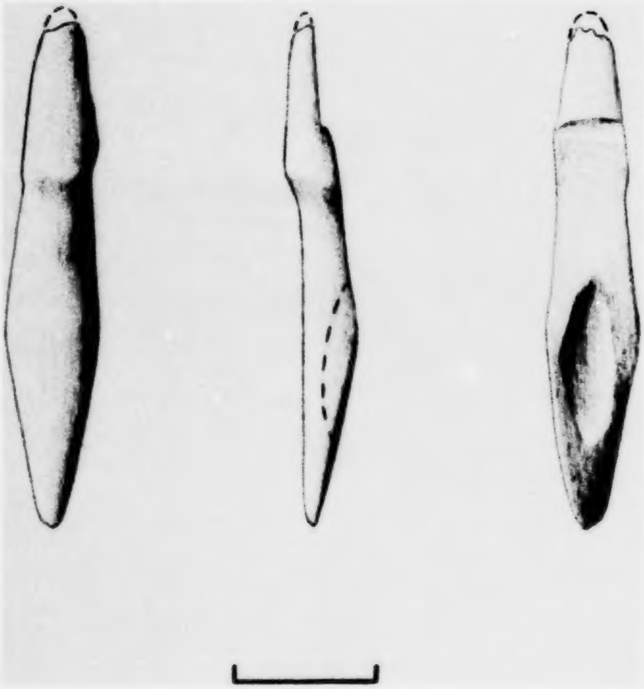


Figure 227. Complete slotted valve of composite toggling harpoon head (1T3A11-333).

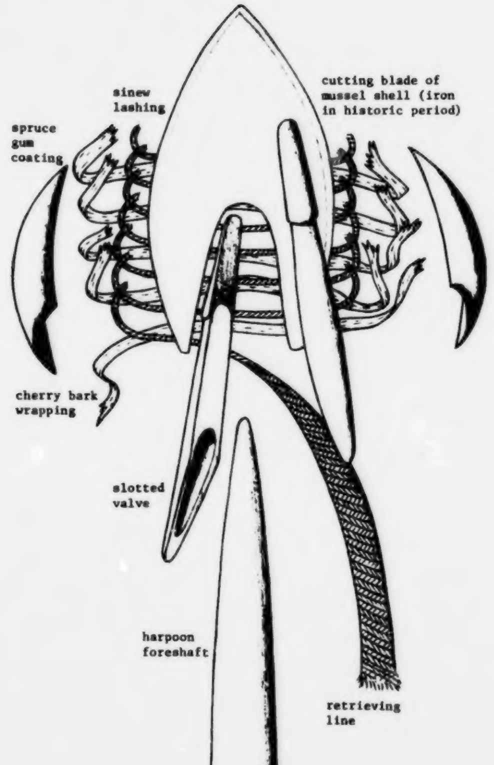

sinew lashing
cutting blade of mussel shell (iron in historic period)
spruce gum coating
cherry bark wrapping
slotted valve
harpoon foreshaft
retrieving line

Figure 228. Exploded view of composite toggling harpoon head for sea mammal hunting.

Unilaterally Barbed Arming Point

A thick unilaterally barbed point of whalebone (Fig. 229) was recovered without provenience. The two barbs are enclosed, high and widely spaced. Sides of the tip of the point form an angle of 15° in outline. The other end is a wedge-based tang 23 mm long, and 9 mm wide by 2 mm thick at the base. In cross section the body is oval and the tang lenticular. The artifact is 111 mm long and 10 mm thick.

The two high barbs, extreme thickness and short wedge-based tang suggest the arming point for a composite harpoon head with slotted valves. Similar large points with few high unilateral barbs sometimes tipped sealing harpoon heads (cf. Giglioli 1895: item 67; Force and Force 1968: 160). The artifact may be part of an ancient type of sealing harpoon head reported by Drucker (1951: 27).

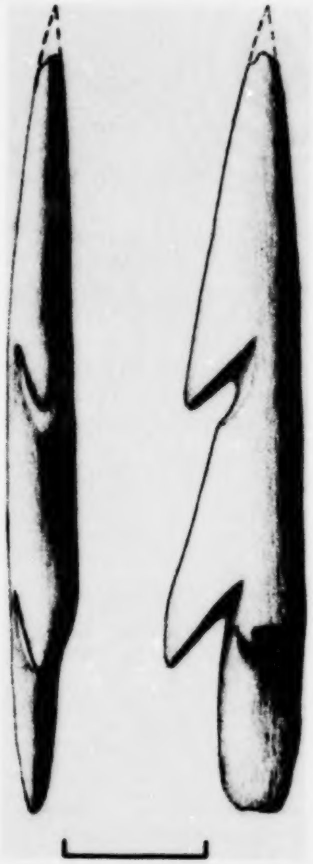


Figure 229. Unilaterally barbed arming point (1T1X1-3575). Whalebone. (Scale: 0-2 cm.)

Possible Slate Arming Blade

Only one slate artifact, 1T1X1-3308, was recovered from the entire excavation, unfortunately without provenience. The artifact appears to be the tip fragment of a bifacially ground arming blade which was originally more or less triangular in outline. The two straight sides of the tip fragment form a 40° angle. The lateral edges are bifacially ground sharp, with thin bevels from 1 to 3 mm wide. Both faces are ground flat. Cross section is flat and lenticular. The artifact is 2 mm thick.

The artifact closely resembles bifacially ground blades of mussel shell and iron which armed composite female harpoon heads used for hunting sea mammals.

Possible Uncompleted Finger Grip

A flat piece of whalebone from the upper levels of stratum IIIc has been shaped into a pear-like outline (Fig. 152h). The edge of one face on the rounded wide edge is bevelled. The narrow end tapers inward to a wedge-like straight edge 25 mm wide. Both faces are ground flat and smooth. The artifact is 105 mm long, 78 mm wide and 11 mm thick.

This artifact strongly resembles the finger grips of sealing harpoons and thrown salmon harpoons and may be an uncompleted grip. The narrow end would serve as a tang to be secured into the butt of the harpoon shaft. The wide rounded end requires only two semi-circular indentations cut side by side into the edge to become complete.

Personal Adornment and Ceremonialism

A total of 119 artifacts is believed to have been associated with personal adornment or ceremonialism. Only several artifacts could be identified from ethonographical sources. Small quantities characterize each class of artifact, making statements on time ranges unfeasible in most cases. Some tendencies, however, are apparent and are discussed in the major groupings of artifacts. These include pendants, beads, clubs, whistles and carved figures.

Two-thirds of the artifacts are pendants perforated or notched for suspension. None, despite several protohistoric and historic proveniences, could be definitely identified from ethnographical sources. Webber's depictions of 18th century Nootkans show considerable use of ear and hair ornaments, some similar to the archaeological pendants. The pendants may also have been used as necklaces, jinglers, charms and decorations on ceremonial apparel. Most pendants are mammal teeth (53) and animal foot bones (17). They are generally little modified, and therefore, when possible, are classed by genus or species. Classes are mostly either distributed over more than two zones, or lacking enough artifacts to indicate temporal ranges. Perforated Otariidae phalanges appear confined to Zone II, and tooth jinglers basically to Zones III and IV.

The beads include 17 specimens made from land mammal bone, bird bone, spruce gum and stone. The tubular stone and spruce gum beads have been truly drilled, instead of biconically perforated. These last mentioned artifacts are confined to historic period deposits.

War clubs and whistles have been identified from ethnographical sources. One-piece whistles of bird bone occur in Zones I and II, whereas composite whistles appear in Zones III and IV.

Carved figures representing animals or deities were found in historic period deposits, but may occur earlier.

Perforated Northern Fur Seal Teeth

Sixteen whole teeth, mostly canines, of the northern fur seal have been perforated or otherwise modified (Table 71; Fig. 230). These artifacts were recovered from Zone IIa, Zone IIIc,d and Zone IVa.

Most teeth have one or two opposing perforations on the lingual or buccal sides near the root tip, depending on the thickness of the tooth sides or broken previous perforations. Young teeth with open root canals had little or no modification of the root end before perforation. They were perforated by conical boring from the exterior side into the root canal. In these specimens, a single perforation near the root end appears to have been generally sufficient. The more mature teeth, however, have thick sides, a more closed root canal or solid root ends. They were prepared for perforation by obliquely grinding down the lingual and/or buccal sides near the root end. The thinned root end was then conically bored from opposing sides, thereby producing a biconical perforation. Minimum diameters of the perforations range from 1 to 3 mm and average nearly 2 mm (n=19). After perforation the roots of most teeth were polished. The crowns were left unmodified.

The fur seal teeth express sexual dimorphism. Ten of the 13 sexed teeth (Table 71) are from females. The open root canals indicate that many of these were young animals.

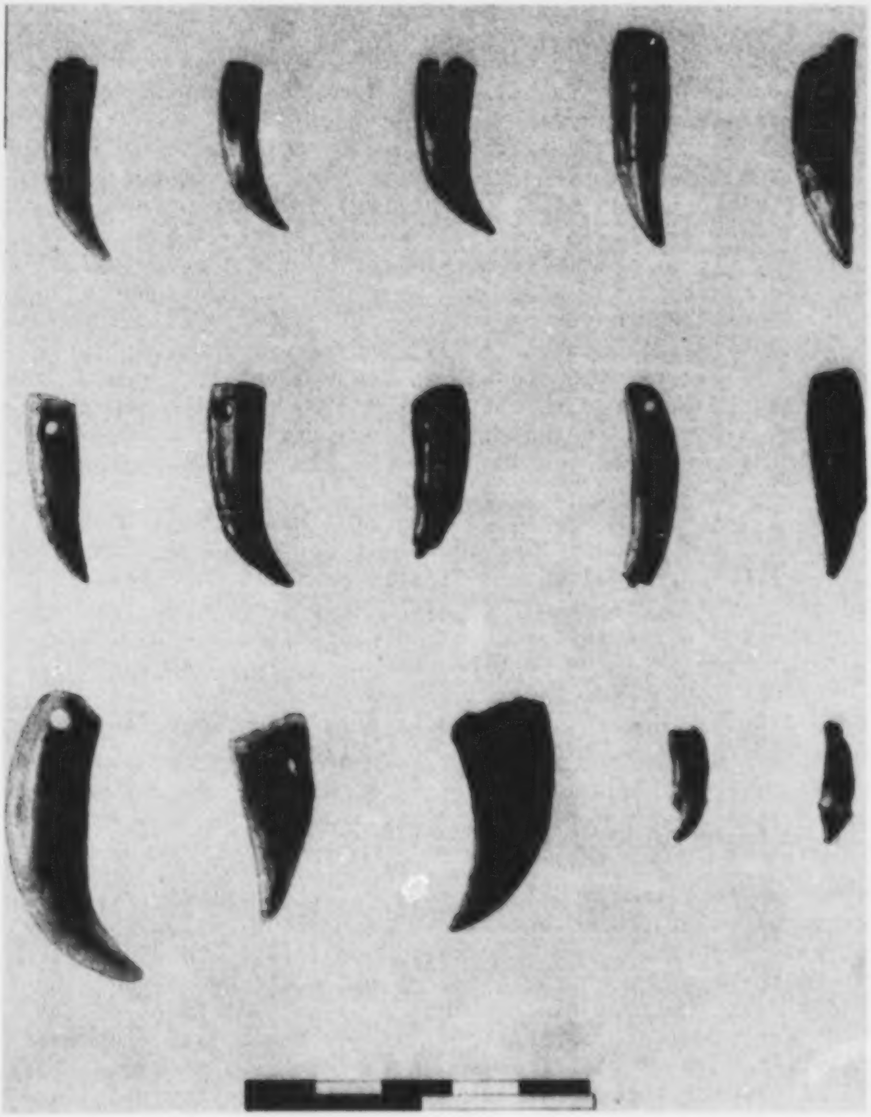


Figure 230. Perforated northern fur seal teeth. (Scale for Figs. 230-235: cm, in.)

Table 71. Perforated Northern Fur Seal Teeth

Zone/Stratum	Artifact No.	Tooth	Sex	Minimum Diam. (mm) Lingual Perforation	Minimum Diam. (mm) Buccal Perforation
IVa	1T1B5-615	R.L. canine	Male	2	not perforated
IVa	1T2D7-2236	R.L. canine	Female	not perforated	not perforated
IIId	1T2A7-3762x	L.U. canine	Female	3	not perforated
IIId	1T3A8-2748x	L.U. canine	Female	2	2
IIIc	1T3C16-2931x	L.U. canine	Female	broken perforation	not perforated
IIIc	1T2E10-3761x	R.L. canine	Female	2	not perforated
IIa	1T1A25A-2868x	R.L. post-canine	?	1	not perforated
IIa	1T2A17-831	L.U. canine	Male	2	3 (mesio-buccal)
IIa	1T1A23-1559	L.U. canine	Female	not perforated	1
IIa	1T1B25-1127	L.L. canine	Female	2	not perforated
IIa	1T1F18-2197	R.L. canine	Female	2	2
IIa	1T2F16A-3835x	L.U. canine	Female	not perforated	not perforated
IIa	1T1H14A-3820x	L.L. canine	Female	1	1 (broken)
IIa	1T1A23-3837x	R.U. 3rd incisor	?	1 (distal)	not perforated
IIa	1T2A23-2739x	R.L. canine*	?	1	1
no provenience	1T1X1-3020	R.L. canine	Male	3 (broken)	3

* From Order Pinnepedia, possibly Callorhinus ursinus.

Tooth Jinglers

Seven hair seal and Steller sea-lion whole canines with large root canals and open root ends are perforated in a distinctive manner. These artifacts were found in the upper levels of Zone IIa, Zone IIIc and Zone IVa,b,c.

All seven canines have been ground on the crown to expose the hollow root canal, thereby forming oval or tear-shaped perforations with a minimum width of 1-2 mm. Three hair seal canines are ground obliquely on the mesial surface of the crown (Fig. 231a,b,f); two, 1T2F8A-5343x and 1T2F9B-5342x, are ground flat on the occlusal surface (Fig. 231c); one is ground slightly flat on the tip of the crown and sawed across the mesio-buccal surface (Fig. 231e). The one sea-lion canine was ground flat on both the crown and root tips (Fig. 231d). Root tips of the hair seal canines are unmodified.

When these artifacts strike one another, they make a flat tinkling sound. This sound and the hollow bodies of the artifacts with the single perforation at the top are reminiscent of jinglers used on ceremonial garments, for example, pubescent girl's hair ornaments with jinglers attached at the bottom (cf. Drucker 1951: fig. 16). Photographs of girls wearing these ornaments show perforated tin thimbles, which have basically the same shape, size and sound of the tooth artifacts.

Perforated Hair Seal Canines

Three perforated hair seal canines were recovered: two from Zone IIa and one without provenience. Two are ground flat on the lingual and buccal sides near the root end to facilitate perforation (Fig. 232a,c).

The third is ground flat on the mesial and distal sides of the lower root; the perforation has broken, and two notches have been sawed across the lingual side just above the broken perforation (Fig. 232b). All perforations are biconical, with minimum diameters of 2 or 3 mm. The roots and part of the crowns have been polished.

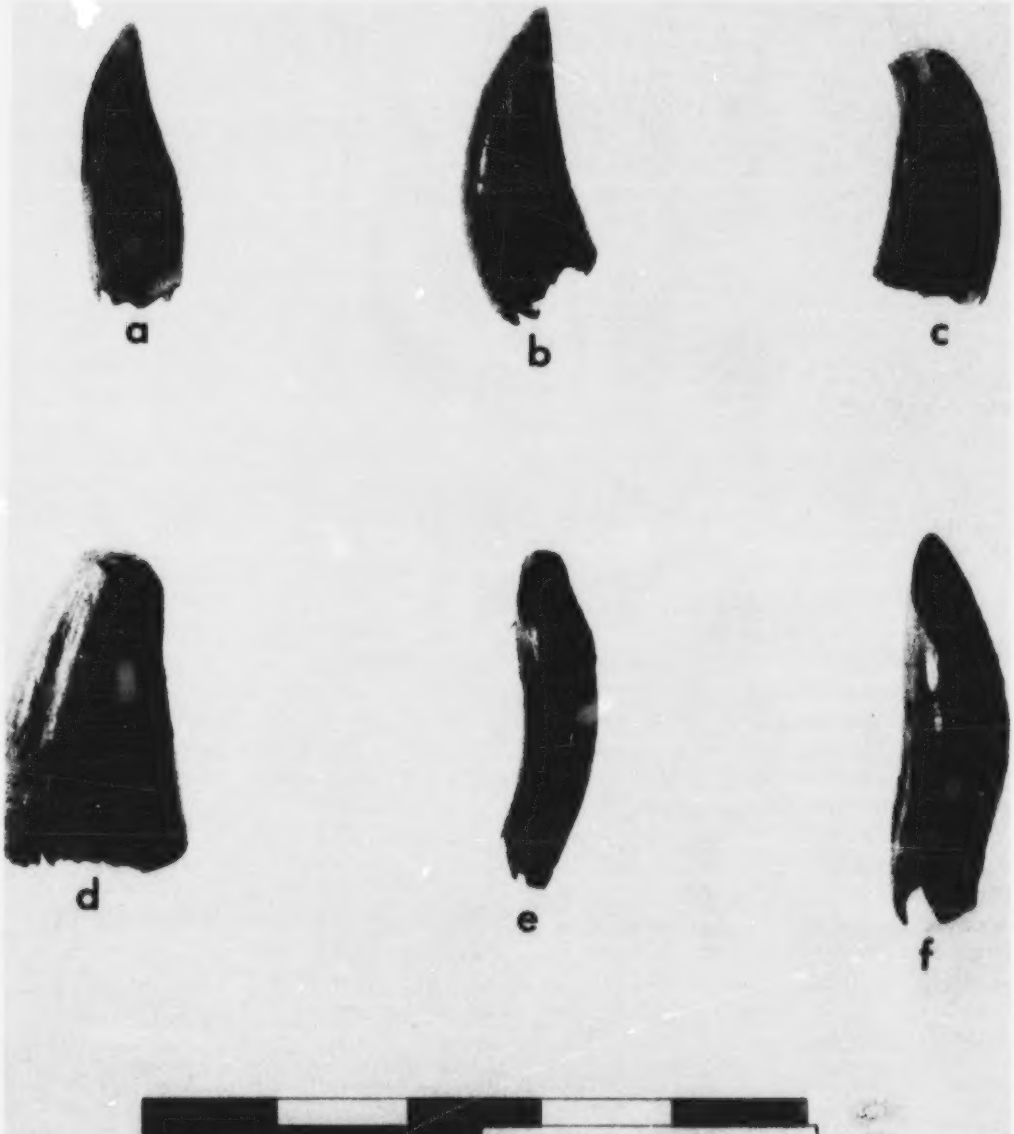


Figure 231. Tooth jinglers: a, 1T1D7-2019 from Zone IVa; b, 1T1X1-3242; c, 1T2F9B-5342x from Zone IIIc; d, 1T2A17-2743 from upper levels of Zone IIa; e, 1T1K3B-3833x from Zone IVb; f, 1T2J5B-3480x from Zone IIIb.

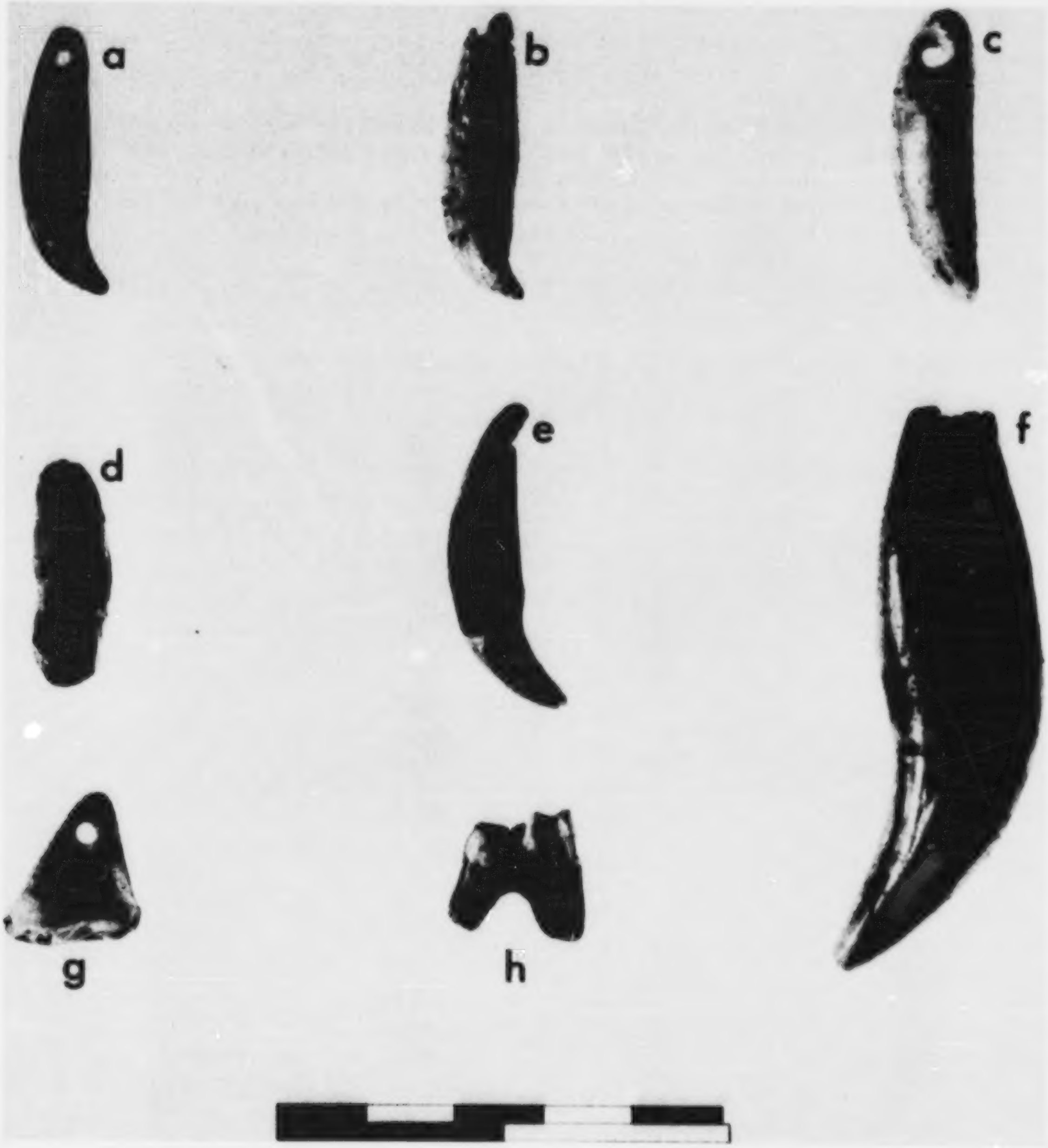


Figure 232. Worked teeth. Perforated hair seal canines: a, 1T1J10-2356; b, 1T1X1-2780; c, 1T3B25A-1167. Canis teeth: d, 1T2B16A-5297x; e, 1T1B16-5324x. Bear teeth: f, 1T1X1-3015; g, 1T3N6-1980x. Deer molar: h, 1T1K2A-5383x.

Worked Sea Lion Postcanines

Only three worked sea lion postcanines were found: two from the Steller sea lion, and the third from either the Steller sea lion or the California sea lion.

A postcanine from the lower levels of Zone IIIc has two opposing notches sawed across the medial and distal sides near the root end (Fig. 233g). The root is slightly polished.

A postcanine from the upper levels of Zone IIa has an open root end. The buccal side of the root is conically perforated 1 mm in diameter (Fig. 233h). The root is slightly polished.

The postcanine of either the Steller or California sea lion, from

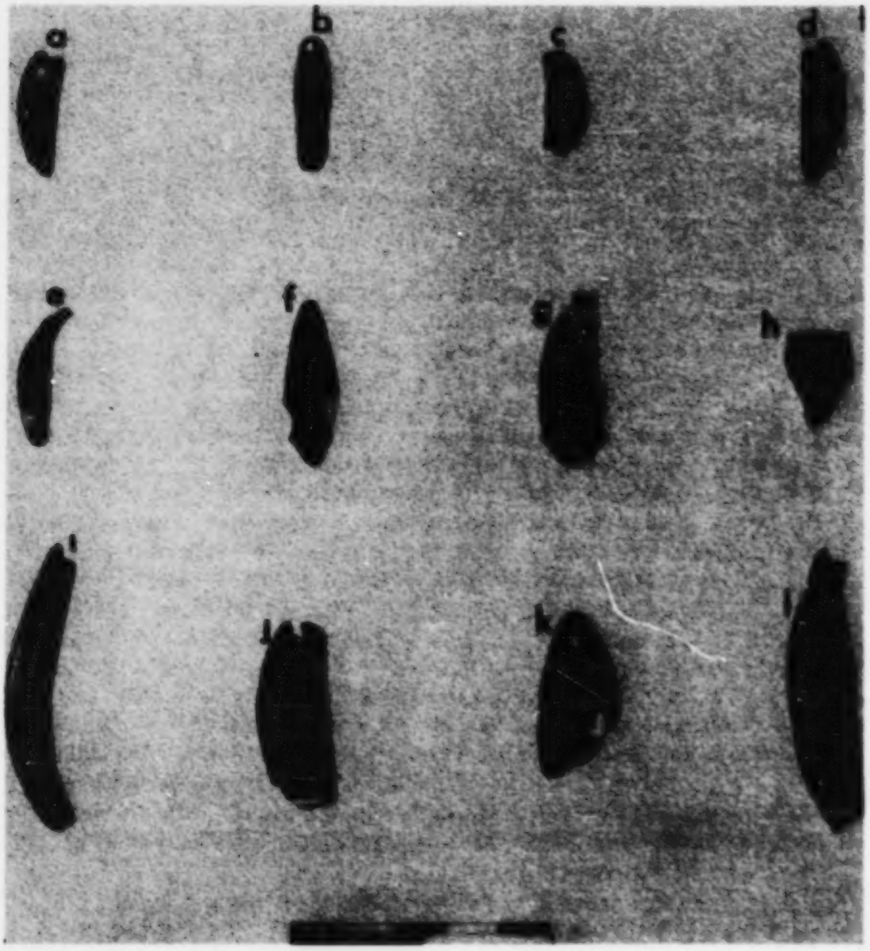


Figure 233. Whole tooth artifacts: a, 1T2G9-1517; b, 1T3B10-648x; c, 1T2G9-3829x; d, 1T1K12-3506x; e, 1T1B6-5327x; f, 1T2J9-2057; g, 1T2F12B-2310; h, 1T2B19-3831x; i, 1T3A11-326; j, 1T3A5-3850x; k, 1T2G15-2064; l, 1T2C9-607.

the upper levels of Zone IIa, is ground flat and tapered on all sides toward a slightly rounded root tip (Fig. 233f).

Worked Sea Otter Tooth

Only one worked sea otter tooth, from Zone IVa, was recovered. It is a permanent right third incisor sawed obliquely on the lingual surface (Fig. 233e).

Perforated Bear Teeth

Only two perforated teeth of the black bear, *Ursus americanus*, were recovered.

A right upper canine, without provenience, was extensively modified (Fig. 232f). All sides near the root end are slightly ground down, and the root tip is ground flat. It has been broken off at several conically bored perforations: two joined on the lingual side, one on the mesial side and two separate ones on the buccal side. The root is moderately polished.

A left third molar from the lower levels of Zone IIa is conically perforated near the root end (Fig. 232 g). Minimum diameter of the perforation is 2 mm. The root tip is rounded, and the root slightly polished.

Worked *Canis* Teeth

Two worked *Canis* teeth were recovered from the lowest levels of Zone IIIc.

A right upper third incisor bears a diagonal groove across the buccal-distal crown surface (Fig. 232d). The tooth is otherwise unmodified.

A left lower canine is notched posteriorly at the root tip (Fig. 232e). There are no other modifications.

Worked Coast Deer Tooth

One worked coast deer tooth was found in the upper levels of Zone IVb. It is a left upper first molar with the roots terminally rounded and smooth, particularly the lingual roots (Fig. 232h).

Whole Tooth Artifacts of Unidentified Mammals

Eight whole tooth artifacts from Zones II, III and IV are so modified that they could be identified only as belonging to medium-to-large or large mammals.

Two polished teeth, from Zone II (Fig. 233d) and Zone IIIb

(Fig. 233a), are ground flat on opposite sides near the root end. Both have broken perforations and have been reperforated. The intact biconical perforations are 2 mm in minimum diameter.

A perforated root fragment from Zone IIIc is narrowed by grinding on opposing sides and rounded at the end (Fig. 233b). The biconical perforation is 2 mm in diameter.

A longitudinal fragment of root and crown from Zone III is perforated in the middle of the root by a conically bored hole 2 mm in diameter (Fig. 233c).

A large root fragment from Zone IIa is tapered on all sides toward the root tip, which is biconically perforated 2 mm in diameter (Fig. 233k). The root and broken upper end are smoothed and polished.

Two elongated, curved pendants from Zone IIId have been shaped from the root and crown portions of large teeth. On one (Fig. 233i) two opposing sides at both ends are flattened and tapered towards the ends. At the crown end a longitudinal groove is sawed into each flattened side. The root end was once perforated, but has broken away. On the other tooth (Fig. 233l) one end is ground obliquely on both faces to form a narrow wedge-like tip, which contains a broken conical perforation. A fine saw groove on each face leaves the perforation and points toward the body of the artifact. Below the groove, a narrow horizontal saw groove rings the artifact. It was perhaps made for suspension after the perforation broke. The surface of the artifact is moderately polished.

A perforated large root fragment, probably from the upper canine or upper third incisor of a large pinniped, was found in Zone IVa (Fig. 233j). The root tip is ground flat, further exposing the open root canal. A conically bored perforation 3 mm in diameter penetrates to the root canal on one side, but the perforation has broken. A second, but not opposing, conically bored hole on the other side of the root does not penetrate the root canal. The root is smoothed and polished.

Split Teeth of Sea Mammals

Ten sea mammal teeth, mostly from Zone III, are split and often considerably ground and polished. Only two of these artifacts appear to have been completed in that they are perforated for suspension or attachment. The others appear to be in various stages of manufacture and presumably would eventually have been perforated.

Two seal canines, from the uppermost levels of Zone IIa (Fig. 234b) and from the lowermost levels of Zone IIIc (Fig. 234a), have been split longitudinally, but are otherwise unmodified.

A fragment of sea mammal tooth from Zone IIa is ground obliquely on the crown and flat on one side of the root (Fig. 234d).

The largest split tooth, from Zone IIa, may come from the northern elephant seal, Mirounga angustirostris (Fig. 234i). A longitudinally split portion of the root with a fragment of crown remaining is slightly ground on the split surfaces. The crown end is broken or chipped into a very rough point. The artifact is 70 mm long and 11 mm thick.

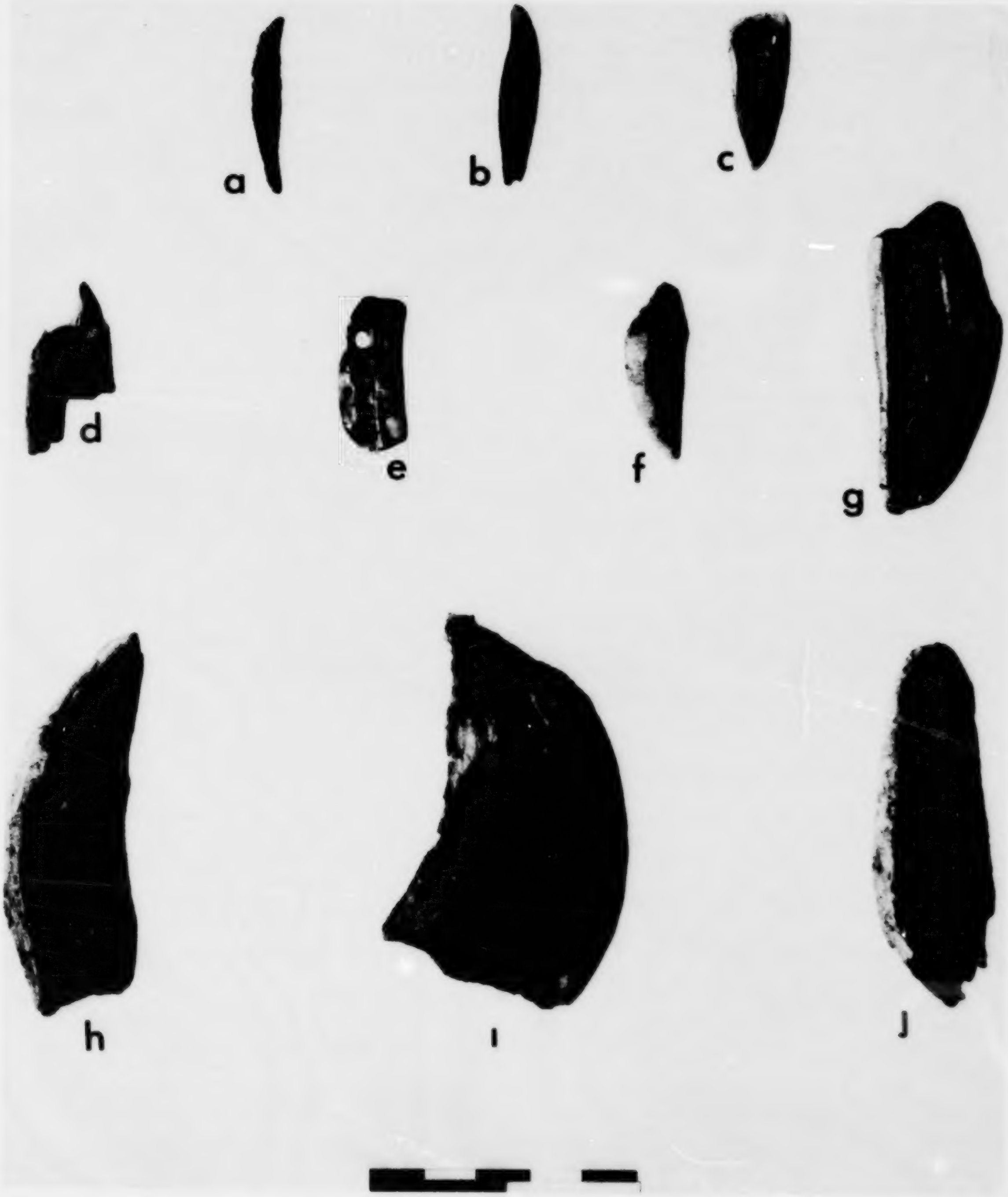


Figure 234. Split teeth of sea mammals: a, 1T2E13-5486x; b, 1T3C19A-5485x; c, 1T1B7-654; d, 1T1B22-5344x; e, 1T1X1-3265; f, 1T1A12-429x; g, 1T1K7-1524; h, 1T1A13-3785x; i, 1T2K11A-3758; j, 1T1C13A-850.

A large pinniped canine from Zone IIIb is split and ground to form a flat section approximately 6 mm thick through both the root and crown (Fig. 234g). The lingual and labial edges are bevelled into smooth ridges. The root end is ground flat. The artifact is 60 mm long.

A split crown fragment of a large canine from Zone IIIc is ground flat and polished on the split surface (Fig. 234f). The base of the fragment is ground into a rough point. The artifact is 35 mm long and 5 mm thick.

A worked canine, probably of the Steller sea lion was recovered from Zone IIIc (Fig. 234h). The tooth is split longitudinally in half, and both the split surface and opposing side are ground flat. The mesial and distal edges are ground into two flattened facets. It is 75 mm long and 12 mm thick.

Another worked canine, probably from the Steller sea lion, was also found in Zone IIIc (Fig. 234j). The crown and root were split longitudinally and ground smooth on the split surfaces. The crown end is roughly ground obliquely to a flattened point. The outer surface of the root is smoothed. The tooth is 70 mm long and 14 mm thick.

A complete split tooth pendant of a Otariidae upper canine (Fig. 234c) was recovered from Zone IVa. The root and crown were split longitudinally through the middle and ground smooth on the rough surfaces left from splitting. All surfaces are polished. A conically bored hole 2 mm in diameter perforates one side of the root near the tip.

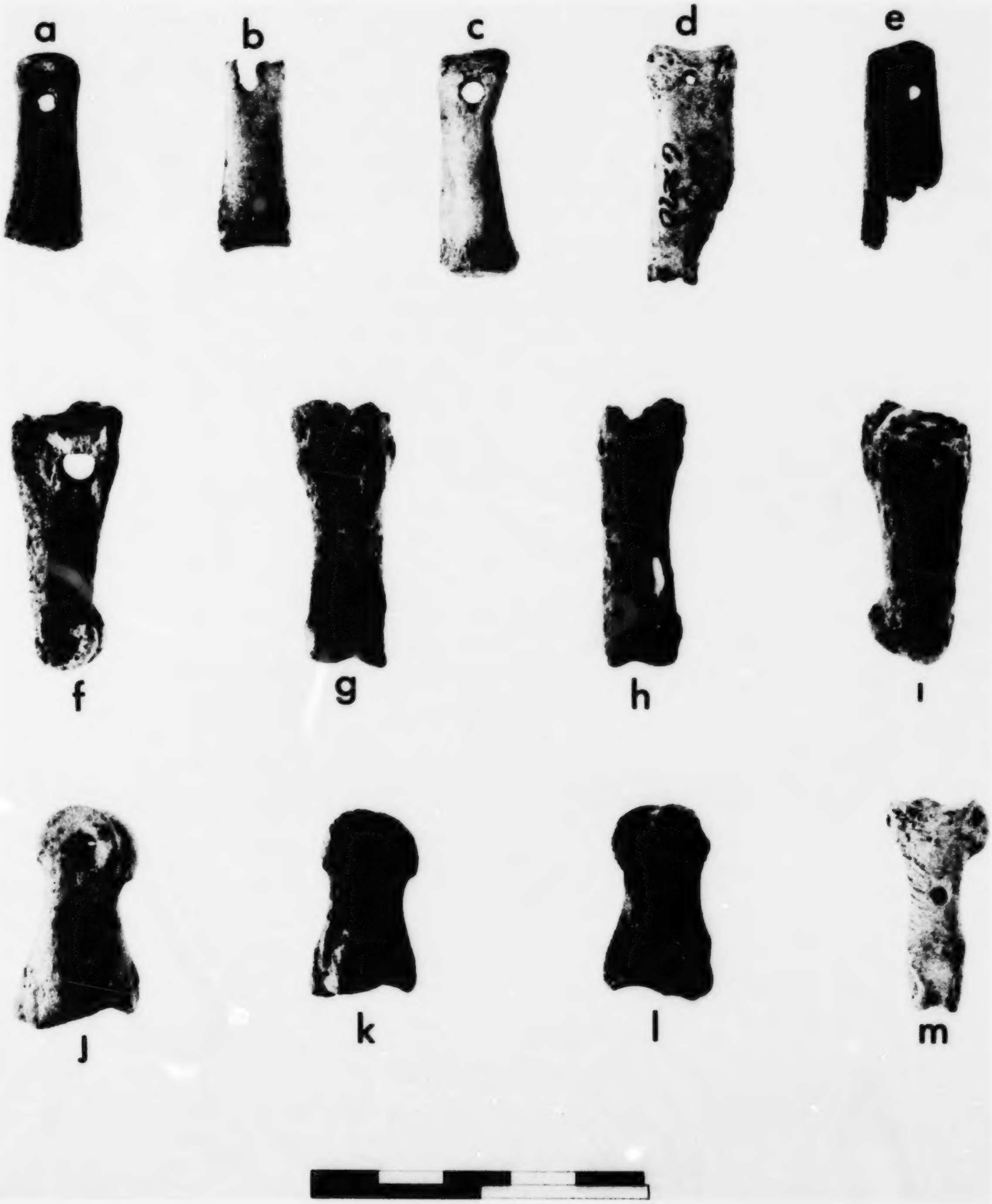
The other complete pendant has no provenience. It is a longitudinal section of root, including all of the tip, from a large mammal (Fig. 234e). All surfaces are smoothed and polished. The root near the tip has a conical perforation 3 mm in minimum diameter.

Perforated Otariidae Phalanges

Five perforated phalanges of sea mammals in the Family Otariidae were recovered from Zone II (Table 72). Only one (Fig. 235c) is complete; the others have lost distal or proximal ends. Perforations are essentially conical, with minimum diameters of 2 and 3 mm. The distal end of one phalanx has been removed and flattened (Fig. 235e). Two other phalanges (Fig. 235b,d) are slightly polished.

Table 72. Perforated Otariidae Phalanges: Proveniences and Measurements

Zone/Stratum	Artifact No.	Minimum Diam. (mm) of Perforation	Fig. No.
IIa	1T2B23-2847x	3	235b
IIa	1T2G16-3816x	2	235e
IIa	1T1N3-3787x	2	235d
IIb	1T1K14A-3508x	3	235a
no provenience	1T1X1-3018	3	235c


a
b
c
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e
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Figure 235. Perforated phalanges: a-e, Otariidae; f-l, coast deer; m, bald eagle (1T1F1-3342x).

Perforated Coast Deer Phalanges

Nine coast deer proximal and middle phalanges, from all four zones, are worked or perforated (Table 73; Fig. 235). Only three are perforated completely through the phalanx (Fig. 235f,h,i). Other phalanges have single, often irregular holes breaking through various surfaces into the marrow cavity (Fig. 235g,h,i,k,l). One such phalanx from Zone IVd was found to contain a broken fish spine and a fragment of metal (Fig. 236) (H. Savage, personal communication), which were probably used to penetrate it. Minimum perforation diameters range from

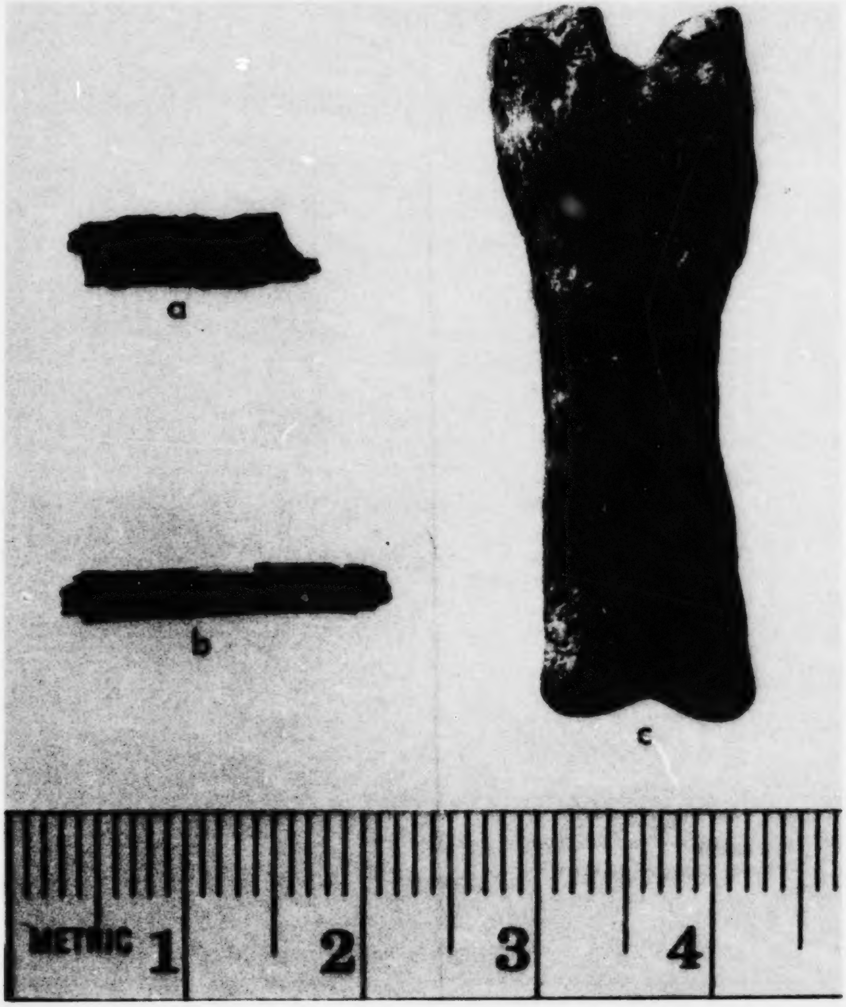

Figure 236. Perforated coast deer phalanx with fragments of tools found within: a, metal fragment (1T2E3-5386x); b, unidentified fish spine (1T2E3-5385x); c, proximal phalanx, 1T2E3-5374x. (Photo courtesy of Dr. H. Savage, Department of Anthropology, University of Toronto.)

1 to 5 mm. It is not clear whether the perforated phalanges are uncompleted pendants or whether they were opened for some other purpose.

Table 73. Perforated Coast Deer Phalanges: Proveniences, Elements and Measurements

Zone/Stratum	Artifact No.	Element	Surface Perforated	Minimum Diam. (mm) of Perforation	Fig. No.
IVd	1T2E3-5291x	middle phalanx	axial	4	235l
IVd	1T2E3-5374x	proximal phalanx	ventral	5	
IVb	1T2H5A-5272x	proximal phalanx	ventral	4	235g
IIIc	1T3B11-5275x	proximal phalanx	ventral	3	
IIIc	1T3C17B-857	proximal phalanx	ventral	4	
IIa	1T1H12-3414x	middle phalanx	axial-abaxial	1	235j
IIb	1T1J12-5274x	middle phalanx	axial	3	235k
Ib	1T2B32-5271x	proximal phalanx	axial	4	235i
no provenience	1T1X1-5273	proximal phalanx	distal articular proximal articular axial	2 3 2	235h

Perforated Bald Eagle Phalanx

A perforated proximal phalanx of the first right toe of the bald eagle (Fig. 235m) was found in Zone IVe. A round perforation 2 mm in diameter penetrates the dorsal surface into the marrow cavity but does not pass through the ventral side. Several cut marks, perhaps from butchering, are on the radial surface.

Perforated Astragali

Two coast deer astragali from Zone IIa have been extensively modified.

On a left astragalus (Fig. 237b), a deep saw groove cuts across the proximal trochlea on the plantar side, and most of the large convex plantar facet is cut away distally. The proximal end is shaped into two arm-like or ear-like projections. The dorsal surface is ground flat, and a saw groove cuts across its middle. A conically bored hole, probably an uncompleted perforation, lies off-centre between the saw groove on the dorsal side and distal end. The medial side is ground flat. The artifact is 32 mm long and 18 mm wide.

A right astragalus (Fig. 237a) is less modified, but perforated. A wide, slanting saw groove cuts across the large convex plantar facet. A horizontal saw groove cuts across the dorsal side almost opposite the plantar groove. A conically bored perforation 2 mm in minimum diameter pierces the proximal end.

The Southern Kwakiutl, with whom the Moachat had contact, had a whirring toy of a deer astragalus on a sinew thread (Boas 1966: 396).

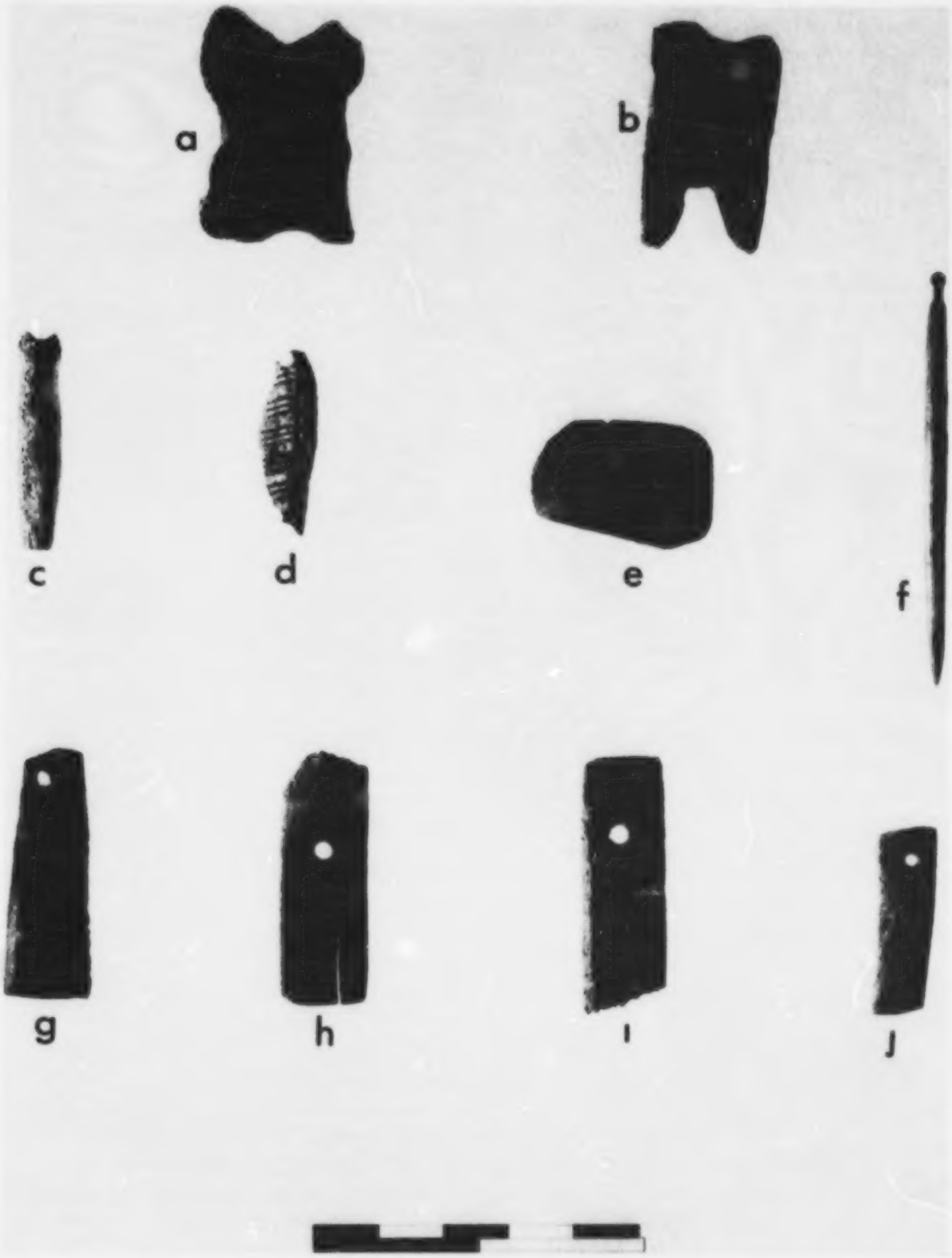

Figure 237. Shaped bone pendants: a, perforated coast deer astragalus (1T1J14-3794x); b, perforated coast deer astragalus (1T1A27-1585x); c, pendant (1T2D20-2684); d, incised pendant (1T3C28-2920x); e, crude disc (1T1D13-3784x); f, needle-like pendant (1T1X1-3125); g, complete pendant (1T2A7-610x); h, flat rectangular pendant (1T1X1-3128); i, flat rectangular pendant (1T1E23-2979x); j, flat rectangular pendant (1T2A16-815). (Scale for Figs. 237-241: cm, in.)

Shaped Bone Pendants

Eight pendants of shaped bone were so modified that species and bone element identifications could be taken only as far as land mammal and sea mammal bone. These artifacts, from all four zones, include a wide range of shapes described separately below.

Of special interest is a fragmentary land mammal bone or antler pendant from Zone Ib (Fig. 237d). Both ends and a long side have broken away. When intact, the artifact was probably plano-convex in cross section. The plane surface is unornamented and ground flat. The convex surface is divided longitudinally by a single straight saw cut. Five bands, each consisting of three parallel incisions, project from the saw groove at an 80° angle, and cover the remaining surface. The outer edge has broken away. On the broken side of the dividing saw groove, traces of an incised zigzag motif remain. The pattern suggests that the zigzag motif was originally contained within two parallel saw cuts and that the groups of parallel incisions once decorated the missing half of the artifact. Broken perforations at each end are 2 mm in diameter. The intact artifact measured about 6 mm thick and more than 28 mm long.

A distinctive pendant of sea mammal bone from Zone IIa has a truncated cigar-shaped body terminating in an expanded ball or knob-like end (Fig. 237c). The body is oval in cross section and is 7 mm wide and 6 mm thick. The truncated end is ground flat. The expanded end, set off from the body by a "neck," contains a broken perforation about 4 mm in diameter. When intact, the pendant was more than 33 mm long.

A roughly oval-shaped piece of mammal skull from Zone IIIc may be an uncompleted pendant or other decorative object (Fig. 237e). All sides are ground flat, but the faces remain unmodified. It is 28 mm long, 19 mm wide and 4 mm thick.

A complete pendant of either sea mammal bone or antler (Fig. 237g) from the upper levels of Zone IIId has a tapered body, rectanguloid in cross section. The sides gradually taper inwards from a wide, flat base and terminate ground thin on opposite faces to facilitate perforation. The small end is ground flat. Several surfaces are faceted. The biconical perforation is at least 2 mm in diameter. The pendant is 38 mm long, 13 mm wide and 12 mm thick.

An unusual land mammal bone pendant, without provenience, has a long needle-like body round in cross section (Fig. 237f). The distal end is pointed. The proximal end terminates in a small round knob set off by an encircling groove 2 mm wide. The body is slightly polished. The complete pendant is 4 mm in diameter and 61 mm long.

Flat, rectangular pendants. Three similar flat, thin, rectangular artifacts may represent a type of pendant. An example of sea mammal bone (Fig. 237i), from the lowest levels of Zone IIa is broken at one end; the intact end and both faces are ground flat. They measure 13 mm wide and 4 mm thick. Each long side is bevelled into three facets. The biconical perforation is at least 3 mm in diameter.

A similar pendant of land mammal bone (Fig. 237h) without provenience is gnawed away on one end. All other surfaces are ground flat. The biconical perforation is at least 3 mm in diameter. The artifact is 14 mm wide and 2 mm thick.

A complete pendant (Fig. 237j) from the uppermost levels of Zone IIa appears to be based on a land mammal rib. Each end is ground slightly convex. The wide end is conically perforated at least 2 mm in diameter. The long sides appear unmodified. The pendant is 19 mm long, 10 mm wide and 2 mm thick.

Shell Pendants

Only two shell pendants were recovered. More shell artifacts were likely present in the midden, but they probably did not preserve well as intact artifacts. Mytilus californianus, in particular, tended to break up into layers, and resembled soggy newspapers.

An upper portion of a pendant (Fig. 238b) from Zone IIb is an extensively worked valve of an oyster, Crassostrea sp. The inner face of the valve, the sides and ends near the perforation are ground flat. Layers on the rough outer face of the valve are ground smooth, leaving a shiny, bright, golden surface. The oval-shaped biconical perforation is at least 3 mm in diameter.

The other pendant (Fig. 238c) from Zone IIa is a perforated valve of a mussel, Mytilus sp. The outer face appears to have been polished. The complete pendant is 26 mm long by 13 mm wide. The biconical perforation is at least 1 mm in diameter.

Stone Pendants

Only two pendants of lithic materials were recovered from late prehistoric and historic period deposits. No artifacts resembling these specimens appear to have been reported or collected ethnographically from the Nootka culture area.

A jet pendant (Fig. 238e) from Zone III is roughly square in midsection, measuring 10 mm wide by 9 mm thick. The upper portion is wedge-shaped, thin, and roughly rectangular in cross section. The thinned wedge-based portion near the tip contains a biconical perforation at least 2 mm in diameter. The base of the artifact is asymmetrically rounded. All surfaces are shiny and smoothed, but without traces of grinding or heavy polishing. It is 24 mm long.

The historic pendant, from Zone IVa, is a perforated, thin, almost eliptical beach pebble of aphanitic basalt (Fig. 238f). One end has a broken conical perforation 4 by 3 mm. A few pecking marks are apparent. It is 37 mm long, 15 mm wide and 4 mm thick.

Possible Labret Fragment

An extensively shaped fragmentary artifact of fine-grained dacite tuff, 1T1E290-5472x, was recovered from the lower levels of Zone Ib. The artifact is so thin and uniformly ground that for a long time it was

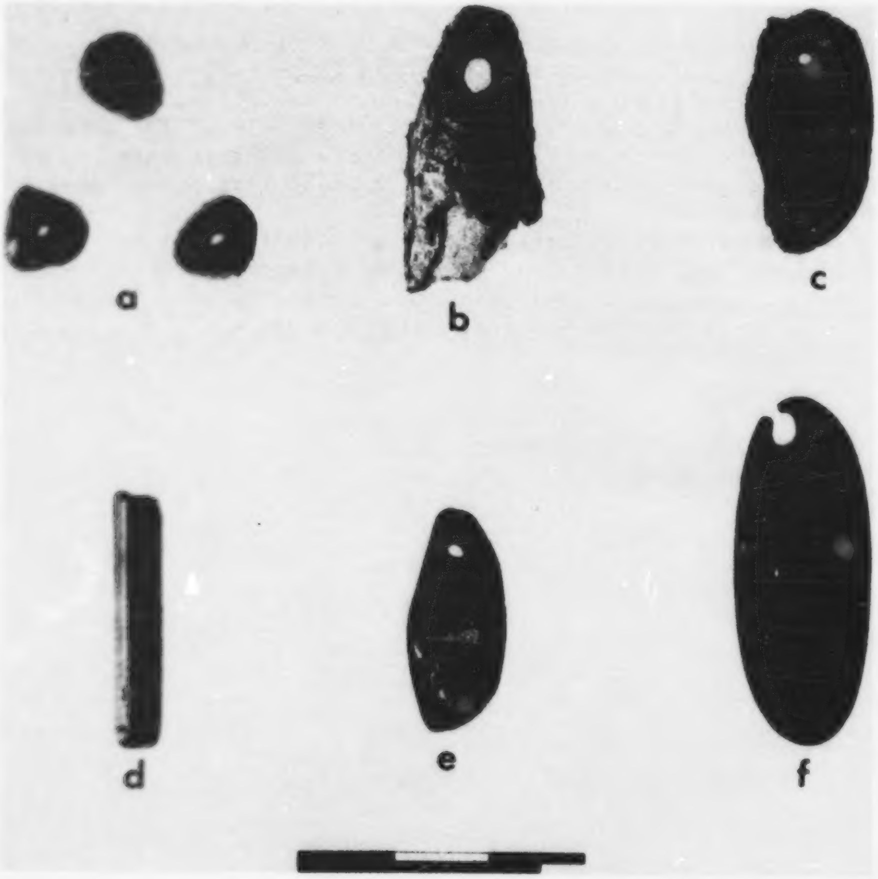

Figure 238. Pendants and historic period native beads: a, spruce gum beads (1T3B1B-3563x, 1T1E2-2963x and 1T2G2-2782x); b, fragmentary pendant of oyster valve (1T1J13-2421); c, pendant of Mytilus valve (1T1G17B-3574x); d, tubular bead of tuffaceous siltstone (1T1H3-1368x); e, jet pendant (1T1G11-1903x); f, pebble pendant of aphanitic basaltic tuff (1T1A3-216x).

mistaken for a lip fragment of a stoneware or earthenware container and included with the ceramics for analysis. The intact edge is from 2 to 2.3 mm thick. It is ground nearly flat, the outer corner being finely bevelled. The artifact is concavo-convex in long section, and flat in cross section. Both faces are ground extremely smooth. The concave face bears three parallel incisions 3.7 mm apart at an oblique angle to the intact edge. The fragment is 26 mm long.

The concavo-convex long section and light weight material bring to mind labrets, but the artifact is so incomplete that one can only surmise its use.

Possible Paint Materials

Many early accounts describe the use of red, black and white paints as a frequent and important body decoration (Cook 1785: 305; Clerke in Beaglehole 1967: 1326; King in Beaglehole 1967: 1394; Ledyard 1783: 71; Meares 1791: I, 318; II, 35, 41-42; Jewitt 1896: 117). The substance of the black paint is not identified, but the red paint is clearly ochre. Samwell (in Beaglehole 1967: 1092) calls a white body paint "white chalk."

A soft, abrader-like artifact of white-grey (Munsell reading 5R 8/1) argillaceous siltstone (Fig. 239a), from the upper levels of Zone IIa was perhaps used for the manufacture of white paint. The stone appears to be too soft for abrading. No red ochre was recovered from the excavation.

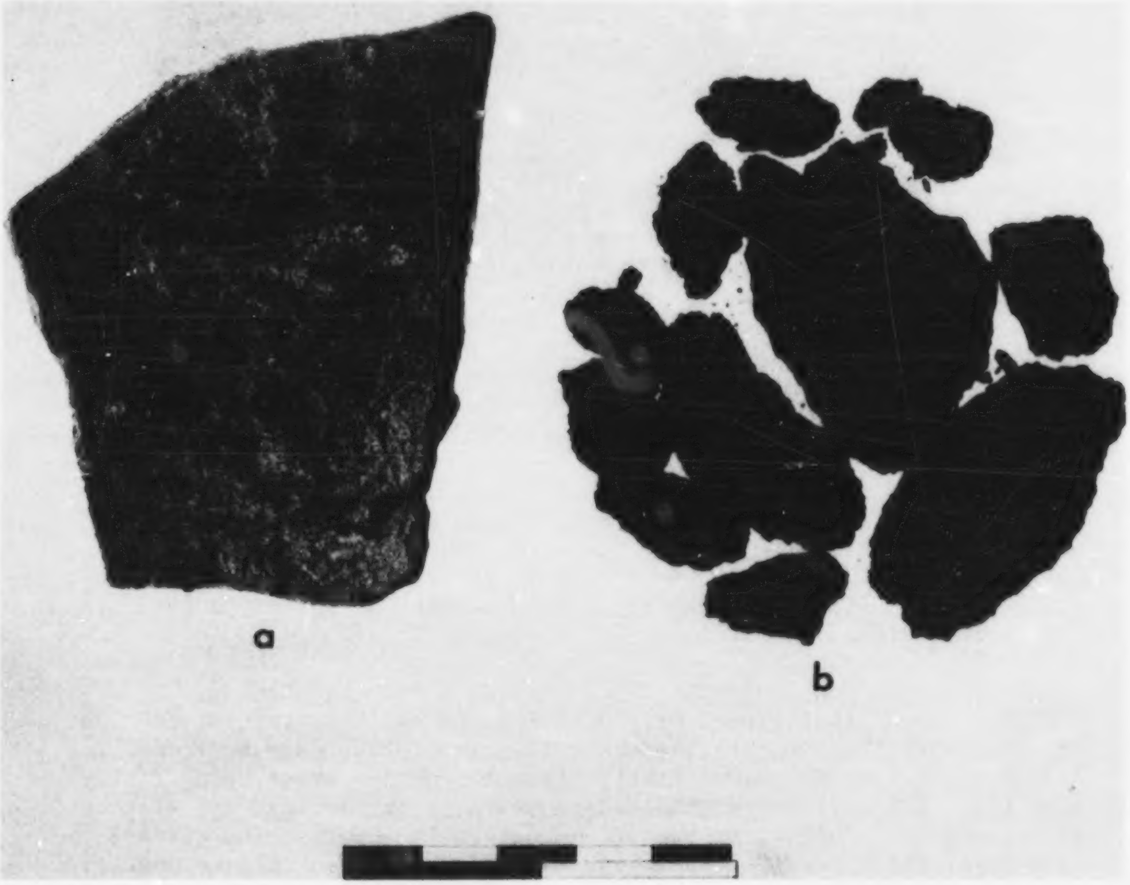

Figure 239. Possible paint materials: a, argillaceous siltstone (1T2A18-5092x); b, schist (1T2F24-5298x).

The Nootkans also sprinkled a fine, sparkling or shining powder on their oiled and painted bodies (Clerke in Beaglehole 1967: 1326; Ellis 1783: 213; Haswell in Howay 1941: 61; King in Beaglehole 1967: 1405; Meares 1791: I, 318; II, 35, 42). Cook (1785: 305) calls this powder "brown martial mica." A sparkling greyish brown granular stone from Zone IIa (Fig. 239b), identified as a medium-grained schist rich in quartz and biotite, may have been used for body decoration.

Land Mammal Bone Beads

Two distinctive artifacts from the upper levels of Zone IIa were likely beads (Fig. 240). Both were made from land mammal bone which

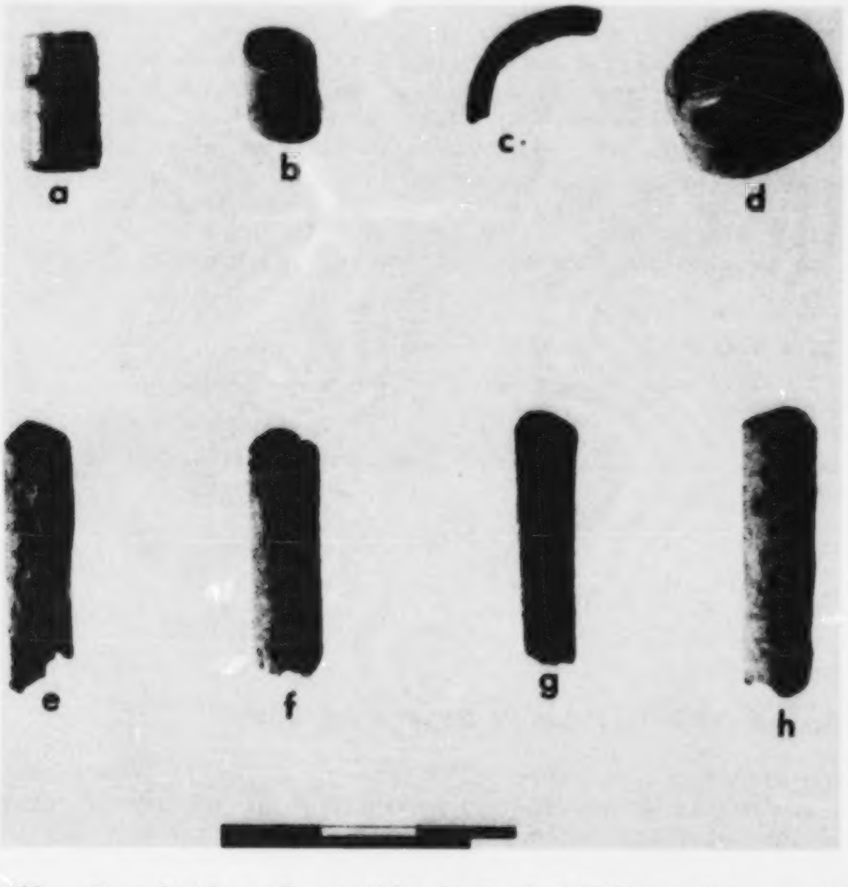

Figure 240. Bone beads and possible tips of drinking tubes: a, tubular bird bone bead (1T1A19-878x); b, tubular bird bone bead (1T3C20-1054); c, fragment of land mammal bone bead or ring (1T2A15-3585x); d, complete land mammal bone bead or ring (1T2D20-2683x); possible tips of bird bone drinking tubes: e, 1T2E7-3799x, f, 1T1E8-3739x, g, 1T2C19A-5407x, and h, 1T1N6A-3800x.

appears to have had a naturally hollow marrow (?) cavity. Segments were sawed halfway through the sides around the bone. The weakened bone was snapped off. The rough ends were ground smooth.

All outer surfaces of the complete bead (Fig. 240d) have been smoothed and polished. A deep saw groove bands the middle. Possibly the intention was to produce two thin beads. The complete bead is 12 mm long, 15-17 mm wide and 4 mm thick. The oval-shaped hole is at least 9 mm in diameter.

The broken artifact (Fig. 240c) resembles a section of the complete bead. The outer side is ground smooth and curved. The inner side is unmodified. Both edges are ground flat. It is 6 mm wide and 3 mm thick.

Bird Bone Beads

Four tubular bird bone beads (Fig. 240a,b; Table 74) were recovered from Zone IIa. A probable uncompleted bead, 1T3A18A-916x, indicates that the beads were formed by sawing halfway through the sides around the bird bone. The weakened bone was then snapped off and rough ends of the break were ground flat and even. Finally, the sides were polished. The naturally hollow bone served unmodified as a stringing perforation. Bead lengths range from 10 to 31 mm; widths, from 6 to 8 mm. Minimum "perforation" widths range from 3 to 5 mm. The bird bones are too modified to permit identification of species and element.

Table 74. Bird Bone Beads: Dimensions (mm)

Artifact No.	Length	Maximum Width	Minimum Width of Bone Channel	Fig. No.
1T1A19-878x	14	8	4	240a
1T3A18A-916x	24	6	3	
1T3C20-1054	10	8	5	240b
1T1N6A-3800x	31	8	4	

Broken Tips of Drinking Tubes or Uncompleted Beads

Seven bird bone artifacts (Fig. 240e-h; Table 75) from Zones IIa and IIIc are broken at one end and ground flat at the other. Minimum widths of the naturally hollow bones range from 2 to 4 mm. Apart from the worked and broken ends, the bones are otherwise unmodified. They are too small for identification of element and species. These artifacts may be either the broken tips of drinking tubes or uncompleted bird bone beads.

Table 75. Broken Tips of Drinking Tubes: Proveniences

Artifact No.	Zone/Stratum
1T1B16-5315x	IIIc
1T3B16-3740x	IIIc
1T1E8-3739x	IIIc
1T2E7-3799x	IIIc
1T2C19A-5407x	IIa
1T2C23-5400x	IIa
1T1N6A-3800x	IIa

Spruce Gum Beads

Three reddish yellow (Munsell reading 7.5 YR 6/10), crude disc-like beads from Zone IVd have been shaped from an amber-like gum or resin (Fig. 238a). Although the beads appear to be amber, they failed a saline flotation test (Kovel and Kovel 1970: 236) for identification of real amber. The beads have the same colour, texture and consistency as the spruce gum coatings on the bindings and mussel shell blades of whaling harpoon heads. The beads are crudely flattened on two faces, which have been pierced with a drilled perforation 1 mm in diameter. The outer sides of the beads are asymmetrical with no apparent well-defined outer shape. All surfaces bear irregular facets, and many corners and edges are rounded. The beads are 9-10 mm long, 9 mm wide, and 5-7 mm thick.

Tubular Stone Bead

One light grey (Munsell reading 10 YR 7/2) tubular bead of tuffaceous siltstone (Fig. 238d) was recovered from the upper levels of Zone IV. The ends are rounded and smoothed but unevenly finished. All outer surfaces are polished. The perforation, drilled off-centre, is 2 mm in diameter. The bead is 28 mm long by 6 mm wide. No examples appear to have been collected or reported ethnographically.

War Clubs

Four artifacts are probably fragments of ceremonial clubs or like weapons. Although three recovered from Zones I and II are at least 2000 years old, they resemble war clubs collected and described historically.

Two whalebone artifacts (Fig. 241a,b), originally ground smooth over all surfaces, are broken at the proximal ends. In outline, the artifacts widen slightly toward the distal end, which is straight with rounded corners. The cross section of the artifact from the lower levels of Zone IIa (Fig. 241a) is lens-shaped, with a slightly rounded blade-like edge on both sides and end. This fragment is 72 mm at the widest part of the face, 22 mm thick and was originally longer than 245 mm. The other fragment (Fig. 241b) with no provenience is rectanguloid in cross section, but has a blade-like distal edge. This fragment is 61 mm wide and 19 mm thick.

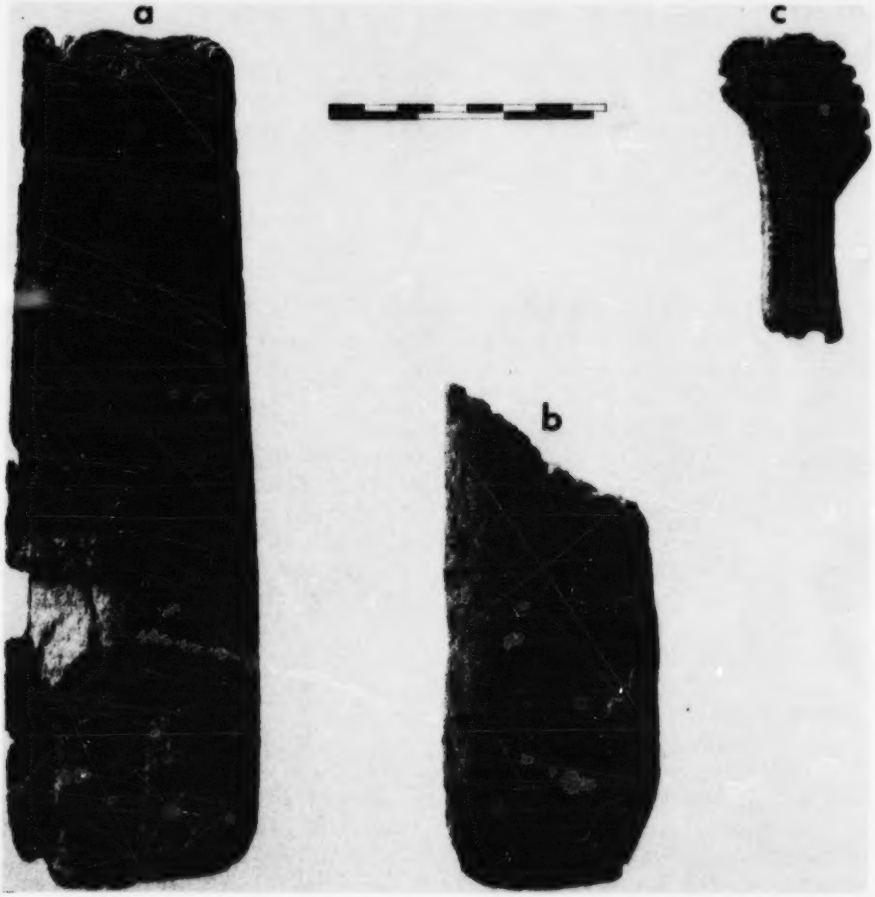

Figure 241. Weapons: a, fragment of war club blade (1T3B24-3782x); b, fragment of war club blade (1T1X1-3161); c, carved handle fragment of club or dagger (1T3N3B-1954).

Both artifacts strongly resemble the blades of whalebone war clubs known historically as tcĪ'tuɬ; such clubs with a "heavy wide flat blade, sharpened along one or both edges" served as the badge of office of war chiefs (Drucker 1951: 335).

Also from the lower levels of Zone IIa is a whalebone club or dagger handle fragment, with a head carved at the proximal end (Fig. 241c). The front of the head is beak-like with a turned down mouth. The top and back of the head bear several rectangular elements, possibly depicting feathers or scales, projecting from a saw groove, and set off from one another by short saw grooves. The top of the head originally bore more projecting elements, but these have broken away. In cross section the upper part of the head is lenticular and the handle is rectangular. The handle broke away at a biconical perforation at least 6 mm in diameter. This perforation was likely for a wrist thong. The handle at the break is 22 mm wide and 14 mm thick.

The beak-like face, downturned mouth, and feather or scale-like projections are similar to more sophisticated carved handles of tcĪ'tuł collected historically (cf. Gunther 1972: 44, figs. 19, 20; Dewhirst 1978: fig. 20).

A fragmentary artifact of dacite tuff (Fig. 242) from Zone Ib may originally have been the striking point of a composite club. The upper portion of the artifact has broken away. In cross section the artifact is lenticular. The blade-like end is convex in outline and straight in end view. It lacks sharpening bevels and wear striae. Both faces near the blade are covered with many horizontal and oblique shaping and polishing striae. The blade-like end is 26 mm wide. The artifact is 30 mm wide and 14 mm thick. The absence of wear and blade bevels, the extremely curved surfaces, and especially the fragile crystalline structure of the stone, all suggest the artifact was not a celt or utilitarian cutting tool. Its celt-like shape, however, resembles the stone points of ceremonial clubs commonly called "slave killers" (cf. Gunther 1972: figs. 11-13).

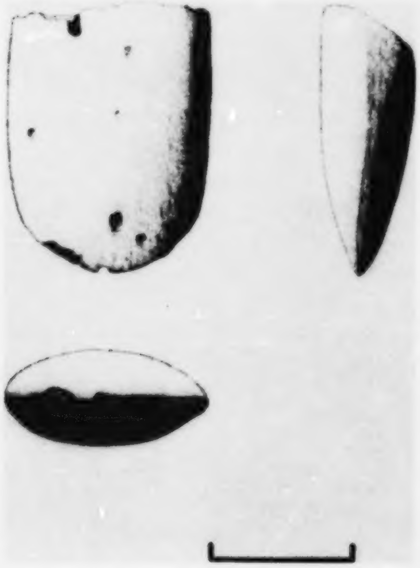

Figure 242. Fragment of dacite tuff blade (1T2F29B-2508x). (Scale: 0-2 cm.)

Whalebone Rings

Two fragmentary artifacts appear to have once been ring-shaped objects cut out of the vertebral discs of whales. A circular inner portion of the discs has been cut away, and the inside edges have been ground down. One artifact from Zone IIIc is ground slightly smooth on the inner face of the disc and along the outer rim (Fig. 243a). It has a maximum width of 52 mm and a maximum thickness of 23 mm. The other artifact, without provenience is ground smooth and relatively flat on both faces and sides (Fig. 243b). It has a maximum width of 46 mm and a maximum thickness of 23 mm.

The use of these artifacts is not apparent. No ethnographic examples seem to have been recorded. No similar artifacts were seen in museum collections.

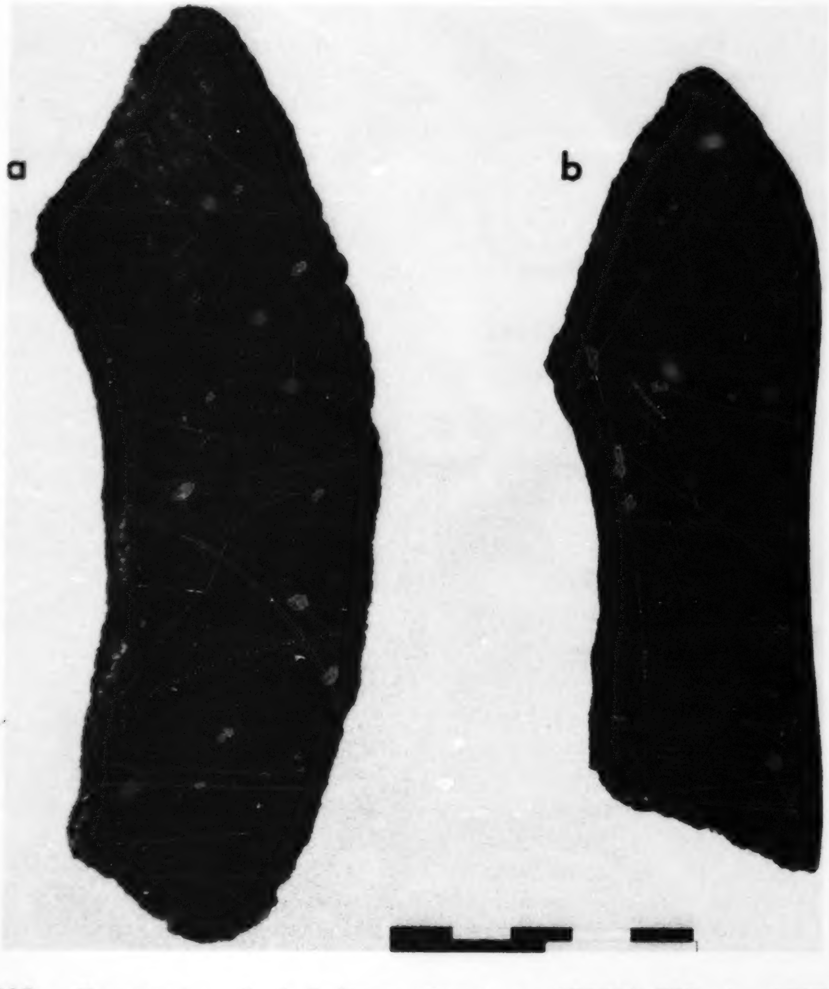

Figure 243. Fragments of whalebone rings: a, 1T1B14-772; b, 1T1X1-3297. (Scale for Figs. 243-244: cm, in.)

Whistles

Two types of whistles were recovered: one-piece and composite. One-piece whistles (Fig. 244) were confined to Zone I and the lower levels of Zone II. Composite whistles were found in the lower levels of

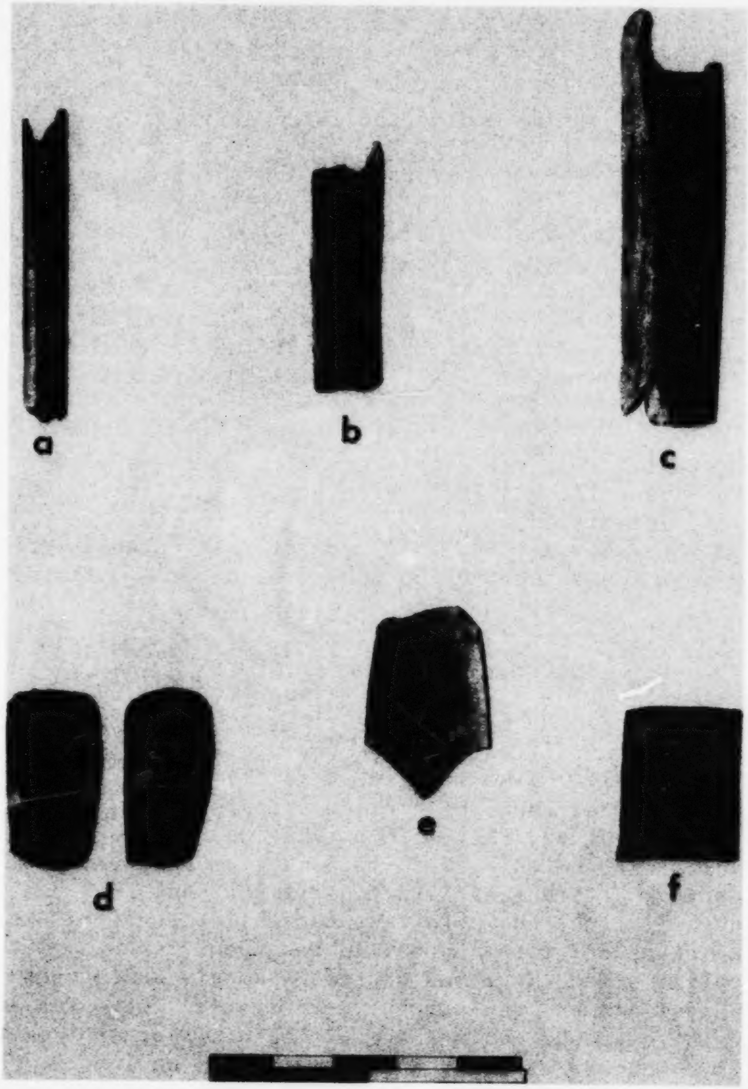

Figure 244. Whistles. Fragments of one-piece bird bone whistles: a, 1T1E26-2463; b, 1T3B25A-2865x; c, 1T1J18A-2553. Valves of composite whistles: d, matched bird bone valves showing dorsal and ventral faces (1T2J3B-1405, 1406); e, fragmentary bird bone valve showing ventral face (1T2D15B-3793x); f, complete land mammal bone valve showing ventral face (1T1A2-140).

Zone III and in Zone IV. Respondents identified the composite whistles as the type used in the Lōqwonå ceremony. The presence of this type in Zone III deposits about 900 years old suggests a long evolution of the Lōqwonå.

One-piece whistles. Three artifacts of unidentified large bird bones have broken at oval-shaped concave perforations into one side of the bone cavity. The smallest artifact (Fig. 244a), from Zone Ib, is either unfinished or broken at the non-perforated end. The intact end of the largest artifact (Fig. 244c), from the lower levels of Zone IIa, is ground flat; the broken perforated end appears to have been reworked with abraders. The intact end of the third artifact (Fig. 244b), also from the lower levels of Zone IIa, has been sawed straight across, but not ground flat. The concave perforations are too fragmentary for meaningful measurements, but the widths and thicknesses of the artifacts from the largest to the smallest are 16 by 11 mm, 11 by 11 mm and 7 by 6 mm.

At first, it was thought that the artifacts were large bird bone barbs with broken points, but the ground sides of the perforations curve upwards and are not ground flat at a downward angle as the sharpened tips of bird bone points. The oval perforations are likely wind stops on small whistles or flutes.

Composite whistles. Four valves of composite whistles were recovered from Zones III and IV. Three of these artifacts were shown to respondents and identified.

Two bird bone valves (Fig. 244d) are of particular interest, because they were found together in Zone IVb, about 1.5 ft. below the surface, and are obviously complete matching valves of the same whistle. In outline, the valves are roughly rectangular, with both ends slightly curved and one end slightly wider than the other. All edges are flat and lack bevels. In long section the valves are flat and parallel sided. In cross section they are slightly concavo-convex. The convex outer faces appear unmodified, but the concave inner faces are ground flat on a narrow area (1-3 mm wide) next to the edge of each long side to form a contact area. When the contact areas of the matched valves are fitted against each other, they form a thin lens-shaped passage. The matched valves are 29 mm long, 14.5-15.5 mm wide and 1 mm thick.

A fragmentary artifact of bird bone (Fig. 244e) from the lower levels of Zone IIIc, not shown to respondents, strongly resembles the thin whistle valves described above. In long section the artifact is thin and parallel sided, in cross section strongly concavo-convex. In outline the sides and end are slightly excurvate. The edges are ground flat. There is no ground contact area. The artifact is 1 mm thick, and was originally about 20 mm wide, and more than 30 mm long.

A complete valve whittled out of land mammal bone (Figs. 244f, 245) was found in the upper levels of Zone IV, within 1.0 ft. of the surface. In outline the valve is almost rectangular; the ends and sides are cut straight, but one end is slightly wider than the other. In long section, the valve is almost plano-convex, the convex surface being the inner face. In cross section the valve is roughly concavo-convex, with the concave surface as the inner face. This face lacks a well-defined contact area, but a 1 mm wide flat strip along each side appears to have served as such. Each end on the inner face is gouge-like, to channel air. If the valve was matched with its mate, the inner faces would form a thin lens-shaped opening. The outer face is slightly depressed to facilitate lashing. Some stains from lashing fibres are apparent. The valve is 25 mm long, 19 mm wide, 4 mm thick in the middle, and 2 mm thick at the ends.

Respondents immediately recognized the three complete valves. They explained that a thin strip of dried fish gut or piece of bark or grass - there was not complete agreement on the material used - was fixed in the lens-shaped passage when the valves were tied together. According to respondents, the whistle was held between the teeth and more or less contained within the mouth. Respondents made a shrill "eeeee" sound in imitation of the whistle and stated that such whistles were used in the Lōqwonå ceremonies. These whistles and their use fit Drucker's description (1951: 395) of the tiny, shrill qīqyåkw whistles concealed in the mouths of child novices and blown on the arrival of the Wolves in the Lōqwonå.

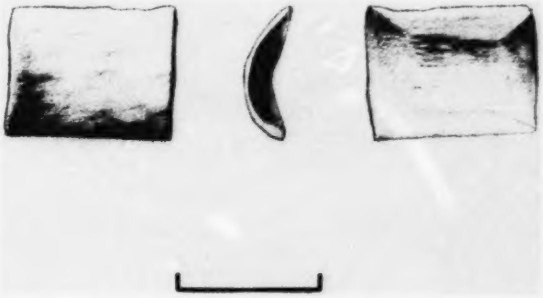

Figure 245. Complete valve of composite whistle (1T1A2-149) showing from left to right: dorsal face, end view outlining one-half of lens-shaped wind passage and ventral face. (Scale: 0-2 cm.)

Figures

In contrast with the well-developed Nootkan sculptural tradition in wood and whalebone known ethnographically, only four carved figures in bone and antler were recovered. One of these is a questionable "figure" from Zone II deposits, which is interpreted as a depiction of a wolf head or wolf mask. The other three artifacts are small zoomorphic figures from historic period deposits. No small carvings like them were present in the museum collections studied. Nor do such items appear to have been reported ethnographically. Respondents, when shown the artifacts, were mystified and could not suggest any use or purpose for them. One speculates that all four artifacts may have served as charms, decorative objects or perhaps toys.

Wolf head or wolf mask figure. A complete artifact (Fig. 246d) from Zone IIa has been fashioned from a small portion of split leg bone of a land mammal. The processes and most of the naturally convex cortex are retained. The sides, however, are ground smooth and taper sharply inward to a flattened end. The artifact is 38 mm long.

The tapering sides and flat end show no wear or working marks to suggest use as an awl or punch. The end would appear too wide and blunt for such a purpose. Instead, the artifact appears to represent a wolf head or wolf mask. The tapering end strongly suggests a snout, and the processes, ears. Such a representation compares well with 18th century wolf masks from Nootka Sound (cf. Force and Force 1968: 182).

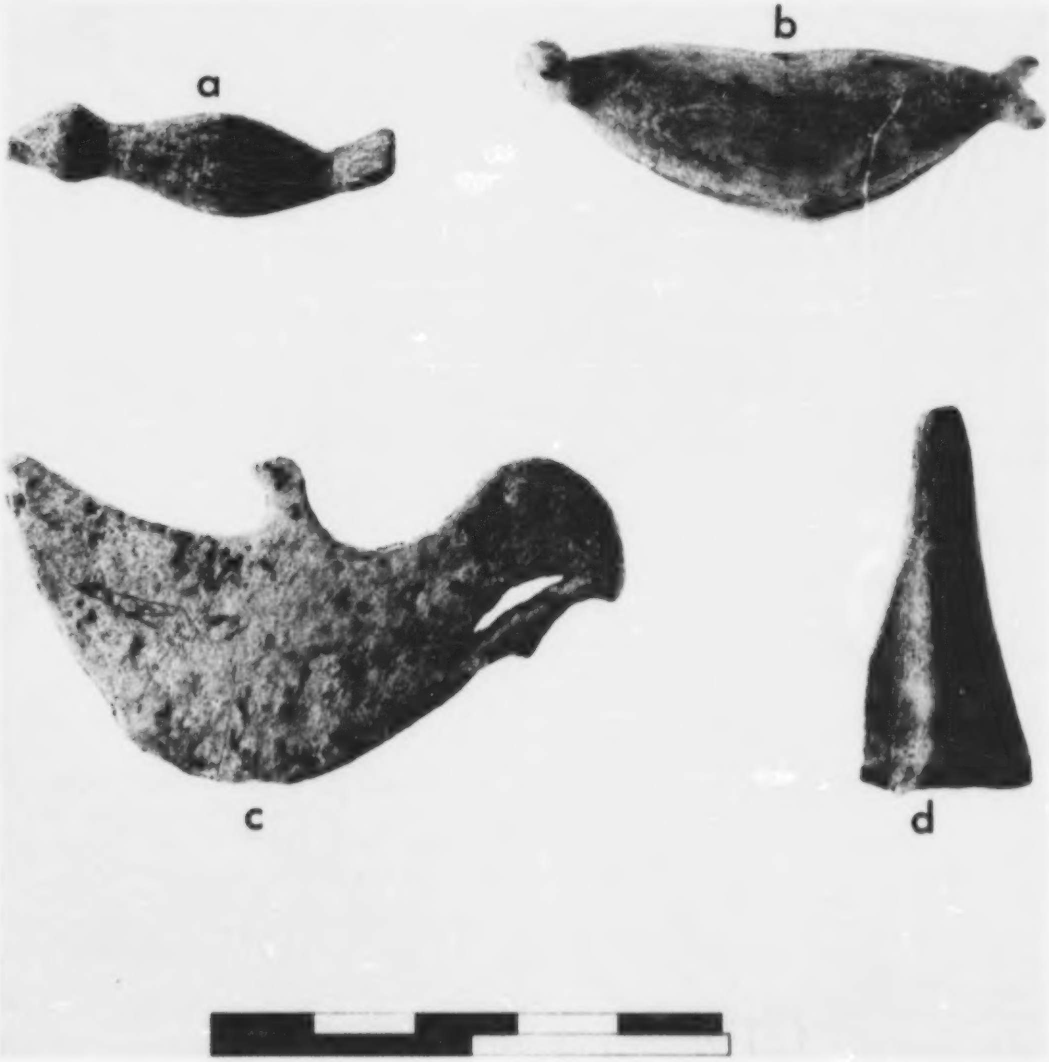

Figure 246. Carved figures: a, bird (1T2J4A-1436); b, seal (1T2G7A-1446); c, Thunderbird silhouette (1T1H3-3405x); d, wolf head or wolf mask (1T1A24-1572). (Scale: cm, in.)

Seal figure. A complete figure of a seal with head and upper body raised (Fig. 246b) from Zone IVb has been shaped from the tooth of a large sea mammal. The tooth has been so modified that only patches of enamel remain, and most of the artifact surface is the exposed dentine. The upper portion of the tooth has been formed into a tiny, knob-like head joined by a thin neck to a massive body. The root portion of the tooth has been ground nearly flat to form the base of the body. A small cavity in the base is the remaining root canal and not a deliberately shaped part of the artifact. Two tiny hind flippers project rearward. All surfaces are smoothed and polished. The figure is 50 mm long and 17 mm wide. The rearward extending flippers suggest the family Phocidae and the harbor seal, Phoca vitulina (Rick 1979).

Bird figure. A tiny bird carving in antler (Fig. 246a) was recovered from Zone IVb. The beak has broken away, but the carving is otherwise complete. The knob-like head is exaggerated in proportion to a lozenge-like body and a small upturned fan-shaped tail. Several fine incisions in the top and bottom faces of the tail indicate feathers. Several lengthwise parallel incisions on each side of the body depict wings. The large eye on each side of the head is a lozenge of four nearly joining incisions containing a single horizontal incision. All surfaces of the carving appear to have been slightly polished. When intact, it was more than 38 mm long.

Thunderbird silhouette. A silhouette carved from a thin piece of sea mammal bone (Fig. 246c) was found in the upper levels of the Zone IV deposits. It is slightly concavo-convex in cross section. The concave face is ground smooth, but not polished. The convex face was obviously intended to be viewed, as it was originally well polished and incised with design motifs, but most of the original surface has eroded away. The silhouette is 63 mm long and 3 mm thick.

The right half of the silhouette is an exaggerated, stylized head, typical of Nootkan depictions of the Thunderbird (A. McMillan and D. St. Claire, personal communication; cf. Ellison 1977: figs. 79, 104). The rounded end is a massive beak decorated along the edge with three circular or semi-circular depressions. The slit-like perforation forms an open, down-turned mouth. An incised lozenge above the mouth probably represents a nostril or an eye. A horn or ear projects from behind the beak. The tuft-like projection on the left side represents the tail. Although much of the polished surface on the middle area of the body is lost, some remaining incisions can be seen. They suggest a snake-like outline filled with a zigzag motif. This is perhaps a stylized depiction of the Haietlik which often accompanies the Thunderbird.

Cultural Continuity and Change

The Yuquot archaeological record exhibits no breaks and no extensive qualitative discontinuities. Detailed analyses of the mollusc remains (Clarke and Clarke 1974b), barnacle remains (Fournier and Dewhirst 1978) and avian remains (McAllister 1979) display remarkable consistency in the ratios of primary species to each other until the historic period. The same is illustrated in a preliminary synthesis of shellfish, fish, and mammal remains spanning the past 3000 years (Dewhirst 1979). Most artifact classes also have long time distributions. Changes in the quantities and classes of artifacts occur, but such changes are mostly minor. Paradoxically, the changes usually indicate cultural continuity in that the more complex artifacts clearly follow simpler versions of the same. Apart from strong Eurocanadian influences after 1870, at no time do the artifacts indicate any major change that might suggest the influence of an appreciably different culture or an unprecedented subsistence orientation. In short, the archaeological record reflects a single culture in a process of improved adaptation to the outside coastal environment. This process has been, for the most part, one of cultural continuity, with gradual change and some innovations.

This strong cultural continuity over the past 4300 years brings into question the appropriateness of usual archaeological models of change for the Yuquot example. Similar problems have been discussed for other sites and areas on the Northwest Coast (Mitchell 1969; MacDonald 1969; Borden et al 1969; Abbott 1972; Hester 1978). The concept of "phase" as usually employed in archaeology is clearly unsuitable for Yuquot for most of the reasons argued by Abbott (1972). The concept of "culture type" has been used to describe a succession of assemblages in the Gulf of Georgia (Mitchell 1971), but this appears to be almost synonymous with "phase" and implies greater change through time than in the Yuquot example. The term "components" is used to isolate sequential archaeological units according to selected artifacts and faunal ratios for the Bella Bella region (Hester 1978).

The Yuquot example requires a model that views the assemblage in holistic terms, as the reflection of a single culture in a continuum of time. Perhaps one "tradition" may be adapted to this cultural continuum model, with apparent stages in the continuum referred to as "periods." A cultural construct in terms of the major technological categories is attempted for each period insofar as is presently possible; a synthesis of artifacts and faunal remains for each period is planned on completion of all the faunal studies. Cultural continuity of the artifact classes is indicated, as well as discontinuous classes that may serve as time markers in the process of change. The four cultural periods, each based on a dated stratigraphic zone, will now be described from earliest to most recent.

The Early Period (pre-2300-1000 B.C.)

This period, contemporary with the late Hypsithermal, is represented by Zone I deposits. As discussed under stratification, sterile deposits were not encountered, so the beginning of the Early Period is yet determined only as before 2300 B.C. Preservation in Zone I, compared to overlying strata, was poor and must be considered when interpreting the cultural remains. The relatively small number of artifacts recovered from Zone I may also result from less intensive occupation, particularly if the site was low-lying and subjected to wave action as suggested earlier. A total of 209 artifacts was recovered from Zone I. They include 41 unclassifiable bone and antler specimens, and 74 abrader fragments. The actual working sample, therefore, consists of only 94 classified artifacts. They are too few and too typologically restrictive for inference of a comprehensive construct of the culture. Nevertheless, it is significant that these artifacts represent 20 classes, of which 19 continue into the Middle Period and often later. The artifact sample, limited as it is, indicates that the basic cultural patterns of later periods are well established in the Early Period. Because the artifact sample comes from Hypisthermal times, it has considerable importance for culture history and is therefore worth listing in detail when discussing each major functional category.

Manufacturing. Manufacturing tools and technology are represented by the following: 31 plane abraders, 10 rectangular abraders of greywacke, 2 rectangular abraders of basaltic tuff and other hard stones, 1 grooved abrader of greywacke, 3 abrasive saws, 1 flat-polled narrow celt (Fig. 48), 4 round-polled narrow celts (Figs. 41-44), 1 other celt (Fig. 57), 1 broad celt (Fig. 63), 2 flaked stone wedges (Figs. 73g, 74), 1 worked basalt flake (Fig. 73a), 5 grooved awls with round cross section, 3 broad-pointed awls, 1 other awl, 1 piercing needle (Fig. 97d), 1 fragmentary needle (Fig. 97f), and 1 other shuttle. These artifacts show that the basic grinding, pecking, and splitting technology used for working stone, bone, antler, wood and shell is clearly present and well developed. Indeed, these tools, except for the worked flake and fragmentary needle, are all found in later periods. It is not unreasonable to suggest that these manufacturing tools, similar to those in use at first contact with Europeans, were also used to generate a wide range of objects similar to those known from early contact times. A well-developed woodworking industry with dugout watercraft and plank houses of some sort was likely present. The shuttle, needles and awls broadly suggest weaving, perhaps basketry and cedarbark clothing.

Fishing. Fishing is represented by at least eight classes of artifacts: 2 spindle-shaped points, 2 small bird bone points with unfinished ends, 2 miscellaneous points, 1 perforated stone, 1 self-armed valve, 1 ancillary valve, 1 harpoon foreshaft (Fig. 152g), 1 sharp-angled point (Fig. 116), and 2 large unbarbed points. These classes and typologically similar specimens are found in the Middle Period.

There are good indications of salmon fishing. A fragment of harpoon foreshaft (Fig. 152g) indicates that female type toggling harpoon heads were in use. Possibly these were for salmon, as suggested by what appears to be a fragment of a small ancillary valve and a distal fragment of a self-armed valve. The two large unbarbed points (Fig. 194) suggest the side points of salmon harpoon leisters or some kind of leister device.

Fishing with composite hooks is inferred from seven artifacts. Two small bird bone points with unfinished ends resemble those lashed to various fish-hook shanks collected historically. The two spindle-shaped points are not as well shaped as the large fish-hook points of the Historic Period, but if found in such deposits they would be included with the spindle-shaped points known to have armed various fish-hook shanks. The miscellaneous points may also have armed fish-hook shanks. The naturally perforated stone is a possible artifact for fishing with lines.

Hunting. Hunting is represented by only six artifacts. A complete stemmed point of dense land mammal bone (Fig. 202) as been interpreted as an arrow point, but could also conceivably have armed a composite harpoon head. A chisel tipped point with trapezoidal tang (Fig. 217) appears to be a reworked male harpoon head, possibly of the bilaterally barbed type which is found in the Middle Period. Four warped, calcined whalebone artifacts (Fig. 203h), found in close proximity to one another, are fragments of a unilaterally multibarbed device, possibly an arrow point or a male harpoon head, like those found in later periods.

Personal Adornment and Ceremonialism. Only five artifacts suggest personal adornment and ceremonialism. A fragment of a one-piece bird bone whistle (Fig. 244a) suggests ceremonialism; such whistles continue into the Middle Period. A fragmentary celt-like stone artifact may be the arming point of a composite club. A perforated phalanx of coast deer which has unknown use was found; such phalanges continue into the Historic Period. A fragment of an extensively shaped artifact with two perforations and a complex incised pattern (Fig. 237d) is of interest. Part of the incised design bears a zigzag motif similar to the punctate zigzag patterns found on the spurs of whaling harpoon heads. A small fragment of a remarkably uniformly ground concavo-convex artifact of dacite tuff is surmised to be from a labret.

The Middle Period (1000 B.C.-A.D. 800)

The Middle Period is well represented by a wide range of artifact classes, totalling 1027 classified specimens, from Zone II, where abundant mollusc remains aided preservation of bone and antler. The Middle Period shows continuity of earlier cultural patterns. If the sample of identifiable artifacts from Zone I were larger, we should probably find that many artifact classes which appear first in the Middle Period in the present sample would be found earlier. While the Middle Period artifacts are not exactly like types known ethnographically, the artifacts nonetheless reflect basic cultural patterns that are known ethnographically. Nootkan manufacturing technology, processes and materials are well established before the Middle Period; this includes cedar bark working technology and probably a wood working industry. Primary subsistence is oriented toward fishing by means of angling and harpoons or leisters. Female type harpoon technology is well developed for fishing. Secondary subsistence appears oriented toward land mammals, followed by sea mammals. There are some suggestions that large multifamily dwellings with permanent frames were used on a seasonal or intermittent basis.

Manufacturing. The manufacturing tools and technology of the Early Period continue essentially unchanged into the Middle Period. The basic cutting and abrading tools are present. Flaked stone wedges continue at least until late in the Middle Period. Broad celts and narrow celts occur. The round-polled narrow celts are gradually replaced by the flat-polled celts, which continue into the Historic Period, but this replacement appears to indicate more of a stylistic evolution than a functional change. Several manufacturing tools from the Early Period continue through the Middle Period, and on into the Historic Period: abrasive saws, rectangular abraders of all materials, plane abraders, grooved abraders, grooved awls with round cross sections, and broad-pointed awls.

Several tools make their first appearance in the Middle Period, but will likely be found in future excavations to occur earlier: bar abraders, concave abraders, nippled abraders, bone celts or gouges, fine-pointed awls (with and without shoulders), grooved awls with flat cross sections, dogfish spine perforators, piercing needles, bark shredders, and bark beaters. All these tools continue through to or into the Historic Period.

Of special significance is a cedar bark shredder of whalebone (Fig. 99b) found at the base of Zone II deposits. This indicates that cedar bark technology was well developed by ca. 1000 B.C. and had probably been in effect earlier. The first direct evidence for bark beaters of whalebone (Fig. 99d) occurs late in the Middle Period, but since beaters are used in conjunction with shredders, the beaters must have been in use as early as the shredders.

Large shuttles (Fig. 98a,b), crude shuttles (Fig. 98g-k) and long, slender shuttles (Fig. 98d,e) appear restricted to ca. 500-0.B.C., but this may be due to the context of our sample. These artifacts which suggest weaving uses come from deposits believed to have formed from the activities within the interior of a large dwelling. Webber's drawings of Nootkans (see Drucker 1965: 147) show weaving with looms taking place indoors; once the dwelling ceased to occupy the immediate area excavated at the site, the probability of finding weaving tools would diminish considerably.

Bevelled bone rectangles (Figs. 100-102) of unknown use, but believed to be net gauges or creasers for basketry manufacture, appear more or less confined to the Middle Period.

Fishing. Primary subsistence orientation was based on fishing salmon, cod and small pelagic inshore species. This is indicated by numerous specimens comprising more than 20 classes of artifacts, most of which continue into the Historic Period.

Fishing with composite hooks is represented by seven classes of artifacts which are inferred from ethnographical specimens to have armed mostly sharp-angled hooks with shanks of wood or bone: spindle-shaped points (Fig. 107, 108), biconvex flat points of bird bone (Fig. 112), small bird bone points with finished ends (Fig. 113), small bird bone points with unfinished ends (Fig. 114), unilaterally single-barbed points (Fig. 109), whole bird bone points (Fig. 115), and thin wedge-based points (Fig. 106). All these classes continue into the Historic Period.

Direct evidence of composite fish-hooks are curved-stem bone shanks (Figs. 119, 126c) which first appear in our sample at ca. 0 B.C. and continue into the middle of the Late Period. However, a wooden curved-stem shank armed with a unilaterally single barbed point was collected by Hewitt in 1792 (British Museum 1925: 250, fig. 256, no. 7). All the sharp-angled composite fish-hooks were likely used for cod and for trolling salmon, as in historic times.

Gorges first appear in the Middle Period and continue through into the Historic Period. Several styles are distinguished: large (Fig. 139), indented (Fig. 140), notched round (Fig. 141), notched flat (Fig. 143), plain flat (Fig. 142), curved (Fig. 144) and miscellaneous (Fig. 144). These devices were likely used, as in historic times, for taking waterfowl and small pelagic inshore feeders such as snappers, perch, rockfish and kelpfish.

Five artifact classes indicate salmon fishing with harpoons: foreshafts (Figs. 149, 152a), self-armed valves (Figs. 156-166), ancillary valves (Figs. 172-178), simple valves of composite toggle heads (Figs. 181, 182) and wedge-based arming points for simple valves (Fig. 183). They indicate a well-developed female-type harpoon technology, which may have been present in the Early Period. The salmon harpoon technology of the Middle Period must have been effective enough by Nootkan standards, because after the Middle Period only refinements occur, while the technology remains essentially unchanged into the Historic Period.

Evidence of taking salmon with leisters is less definite. Large unbarbed points (Fig. 194) which appear to continue from the Early Period and end about 200 B.C. are interpreted as leister side points. An unusual, nearly completed artifact (Fig. 193) suggests the centre point of a leister.

The importance of salmon for subsistence implies an annual round scheduled to exploit this fluctuating resource and related resources. A cycle with scheduling based on the cultural principle discussed early in this paper may well have been in effect.

Hunting. Secondary subsistence is probably oriented toward land mammals and birds, followed by sea mammals. Artifactual evidence for the relative importance of these resources is severely limited and somewhat vague. This question will be properly resolved only with analysis of the Yuquot mammal remains.

Hunting with arrows, presumably of mainly land mammals and birds, is represented by a stemmed point of split bird bone (Fig. 203j), points with many closely spaced barbs (Figs. 203a,k; 204e) and isolated fragmentary points (Fig. 203g,h,i). Assuming that the multibarbed and stemmed points tipped arrows for hunting land mammals, especially the small coast deer, the paucity of these artifacts would lead us to infer that such mammals were of minor importance. However, the fact that most artifacts described in this report are of land mammal bone or antler (see also Rick 1979) indicates that land mammals, probably coast deer and elk, were taken often. Interim reports on the Yuquot mammal analysis (H. Savage, personal communication) show abundant deer remains in the midden. If deadfalls were relied upon for taking most deer, bear and fur bearers, as reported ethnographically (Drucker 1951: 32-33), few land hunting artifacts would show up in the assemblage.

Sea mammal hunting was based on a male type harpoon technology, as indicated by three classes of non-toggling male harpoon heads and few specimens. The earliest, unilaterally barbed with a shouldered tang (Figs. 211-214), is found throughout the Middle Period. A distinctive bilaterally barbed head with bilateral line guards (Figs. 208-210d) appears restricted chronologically to ca. 400 B.C. to A.D. 100. At the transition from the Middle to the Late Period, a large unilaterally multibarbed head with line hole (Fig. 215) was recovered. These non-toggling heads were probably used for seals, sea lions and perhaps sea otters. The male heads were probably not effective enough for whales, which were hunted with toggling female type heads.

Personal Adornment and Ceremonialism. Personal adornment and ceremonialism are reflected by a wide range of pendants and other artifacts. Perforated coast deer phalanges (Fig. 235) continue from the Early Period into the Historic Period. Perforated coast deer astragali (Fig. 237a,b) appear to have a chronological distribution of ca. 500 - 0 B.C. Perforated Otariidae phalanges (Fig. 235) are roughly contemporary with them. Perforated hair seal teeth (Fig. 235a,c) and perforated fur seal teeth (Fig. 230) are found as early as ca. 300 B.C. and continue through the Middle Period. Jinglers of perforated fur seal and hair seal teeth (Fig. 231d) begin very late in the Middle Period and continue into the Historic Period. Cylindrical bird bone beads (Fig. 240a,b) are found late in the Middle Period. Fragments of bird bone shafts with flattened ends (Fig. 240g,h), which may be unfinished bird bone beads or tips of drinking tubes, are found in the Middle and Late Periods. Single-piece whistles which continue from the Early Period appear to discontinue early in the Middle Period. Bladed whalebone clubs (Fig. 241) resembling warclubs collected historically occur ca. 500-0 B.C. and presumably continue into the Historic Period.

Several artifacts can be roughly dated by their proximity to dated firepits or strata. A fragmentary pendant of oyster shell (Fig. 238b) dates ca. 300-0 B.C. A large split tooth (Fig. 234i), perhaps of the northern elephant seal, probably has a date range of ca. A.D. 0-200. Small rings or beads of land mammal bone (Fig. 240d) occur late in the Middle Period. A carved bone, perhaps representing a wolf mask or wolf head (Fig. 246d), dates to ca. 200-0 B.C.

The above artifacts allow few inferences regarding adornment and ceremonialism. The bladed whalebone clubs with carved handles, like those used as badges of office historically, suggest status and ranking in the society. Perforated seal teeth, deer phalanges and bird bone shafts, also found in the Historic Period, imply a long tradition of whatever rituals were associated with these objects.

Habitations. Although no direct evidence is available for types of habitations in the Middle Period, features allow significant inferences. The rock-rimmed firepits which are built up on each other and appear to cluster in two areas in the trench would appear to have this configuration if they were positioned in relation to some relatively permanent structure. This could perhaps be a large multifamily dwelling, with at least a permanent frame. The relocation of firepits on each other suggests a non-continuous, perhaps seasonally reestablished, residence. Radiocarbon dates on charcoal from the firepits indicate that the fires and inferred habitations were in use by ca. 200 B.C.

The Late Period (A.D. 800-1790)

The Late Period is represented by 913 classified specimens from Zone III. Nearly all the cultural patterns of the Middle Period continue into the Late Period, when they become refined and more specialized. Manufacturing technology and tools remain essentially unchanged from the Middle Period, except for the introduction of large amounts of iron which may have occurred shortly before first contact with Europeans. Fishing technology appears to become generally more specialized. A specialized salmon trolling hook is developed late in the period. The most profound changes take place in harpoon technology for hunting sea mammals. All these refinements and innovations indicate an increased orientation toward outside resources. This may be a response to an insufficient number of resource properties in Nootka Sound to support all the local groups in the two-part annual subsistence cycle. The archaeological record of the Late Period largely reflects Nootkan culture as it is known from early historical and ethnographical sources.

Manufacturing. The same manufacturing tools and techniques of the Middle Period continue relatively unchanged, except for the introduction of iron cutting tools.

Most tools of the Middle Period continue through the Late Period: abraders of all shapes and materials; abrasive saws; flat-polled narrow celts; long, narrow thin bone wedges; broad, flat thin bone wedges; dogfish dorsal spine artifacts; grooved awls with flat cross section; grooved awls with round cross section; fine-pointed awls; fine-pointed awls with shoulders; broad-pointed awls; piercing needles; and long slender shuttles. Some classes of tools found in both the Middle Period and either late in the Late Period or the Historic Period are inferred to have continued through the Late Period: broad celts, bone celts or gouges and bark shredders. Some tools found in the Historic Period or recorded by 18th century European visitors to Yuquot are inferred to be present in the Late Period: antler sleeve hafts, hand mauls, cobble hammers and shell celts.

Manufacturing tools that first appear in the Late Period are wedge-tipped awls, beaver incisor cutting tools, shell knives, and stone knives. Future excavations will probably show that these tools occur earlier.

The most important change in manufacturing is the introduction of iron in quantities large enough to have significantly improved the efficiency of Nootkan cutting tools. Iron chisels and knives were common at Nootka Sound in 1778 (Cook in Beaglehole 1967: Vol. 1; 321). The sources of iron and its time depth among Nootkans, however, are not yet known. Iron dating to the first millenium A.D. has been found in the Old Bering Sea Culture (Levin and Sergeyev 1960). Such iron originating in Asia could conceivably have diffused around the North Pacific Rim to Nootka Sound at this time as well. According to Nootkan stories and a few recorded instances, another possible source of iron was the wreckage of Oriental ships (Rickard 1939). It would seem, however, that both these sources could not produce the quantities of iron observed by the Cook expedition. Iron no doubt became common on the Northwest Coast after expansion of Russian fur traders into Alaska in the mid-18th century. In addition, increasing quantities of iron probably diffused via native trade networks to the Northwest Coast as European settlement and traders moved northward from Mexico and westward from eastern North America. Therefore, it would appear that iron became common among the Nootkans only for a relatively short time before direct European contact, perhaps within the 18th century. The working of bone and antler artifacts suggests a paucity of iron tools until the Historic Period, or shortly before. Prehistoric bone and antler artifacts bear long facets or bevels which are primarily a result of abrading. Bone and antler artifacts of the Historic Period, when iron tools were abundant, are clearly more whittled than ground. This is apparent on the spindle-shaped arming points of composite fish-hooks.

Fishing. Fishing, represented by 26 artifact classes and numerous specimens, is still the primary means of subsistence. Most fishing artifacts of the Middle Period continue into the Late Period. The Late Period fishing artifacts, however, reflect increasing refinement and specialization in fishing technology through time. This process is indicated by more small sizes of artifacts, more stylistic variation, and the appearance of new artifacts.

Fishing with composite hooks is represented by seven classes of arming points continuing from the Middle Period: spindle-shaped points, unilaterally single-barbed points, biconvex flat points of bird bone, small bird bone points with finished ends, small bird bone points with unfinished ends, whole bird bone points, and thin wedge-based points. The curved-stem bone fish-hook shanks also continue from the Middle Period. In the Late Period three classes of fish-hooks first appear: rectangular-based bone shanks (Figs. 122, 126), rectangular-based stone shanks (Figs. 127, 130) and bent-stemmed stone shanks (Fig. 132). The stone shanks that appear late in the Late Period are known to have been used for salmon trolling, and indicate further refinement in fishing technology. The small sizes of bone shanks, stylistic variation in stone shanks and small examples of spindle-shaped points and unilaterally single-barbed points all suggest increasing refinement and specialization of fishing.

Gorges were found in greater numbers in the Late Period. The following styles from the Middle Period continue: large, indented, notched round, notched flat, plain flat and curved. Four styles occur through the Late Period and into the Historic Period: double-indented rectangular, tiny, scalene and plain round.

Salmon fishing with harpoons is represented by six artifact classes. They indicate a gradual refinement of the togglehead for salmon from a poorly standardized simple shape to a well-standardized complex shape. Self-armed valves and simple valves continue from the Middle Period, but diminish and appear to discontinue before the end of the Late Period. Wedge-based arming points of the simple valves also diminish appreciably, but continue into the Historic Period. The greater numbers of wedge-based arming points compared to simple valves may result from wedge-based points arming wooden valves that had disintegrated. Channelled salmon harpoon heads armed with biconical points represent the most improved salmon harpoon head. These artifacts occur in large numbers in the Late Period, as they replace the simple valves with wedge-based points. Ancillary valves, present in the Middle Period, are also found in the Late Period; these valves, however, are not necessarily limited to salmon fishing, and may have been attached to female heads for sea mammal hunting.

Harpoon-leisters for salmon (Drucker 1951: 20, fig. 3j) were collected by the Cook expedition (Gunther 1972: 216, item 70). No provenience was recorded for them, but they are typical of Nootkan leister-harpoons collected later and therefore indicate usage in the Late Period. An unusual find from the early Late Period is probably an uncompleted whalebone arm of a harpoon-leister (Fig. 192). Short stout unbarbed points may have been side points of harpoon-leisters.

Hunting. The greatest innovations and refinements take place in sea mammal hunting. The basis of harpoon head technology changes from the male to the female principle. It assumed that the non-toggling male heads would dislodge more easily than the toggling female heads and would therefore be ineffective for whaling. The non-toggling single-piece male heads (Figs. 208-219) are replaced early in the Late Period by toggling female heads armed with shell cutting blades (Figs. 222, 223, 225). Such heads are known to have been used for sea mammal hunting (Waterman 1920; Drucker 1951: 26-29). The large slotted valves with punctate patterns (Figs. 220, 222), like those on whaling harpoon heads collected historically, probably indicate whale hunting. Whaling is therefore inferred to be directly associated with the large slotted valves that first appear early in the Late Period. The change in harpoon technology and development of whale hunting signify improved adaptation to the "outside" setting, but do not indicate a fundamental change in subsistence orientation. Fishing remains the primary basis of subsistence.

According to Nootkan tradition, whaling was invented by groups obliged to live year-round on the outside, where there are no salmon streams of consequence, and wintering proved to be a hardship (Drucker 1951: 49, 228-9). These outside groups were too weak politically and militarily to possess resource properties on the inside and consequently had to depart from the preferred model of exploitation of the outside and inside settings on a seasonal basis. The fact that groups were compelled to live in one setting year-round suggests that by ca. A.D. 1000 the population of Nootka Sound had grown so that all the limited resources in both settings were owned by the social units. A major concern of Nootkans was to obtain resource properties in both settings. Nootkan histories record constantly shifting alliances and intermittent warfare to attain sufficiency in both settings (Dewhirst 1977, 1978). The improvements in sea mammal harpoon technology, particularly the development of whale hunting, may have resulted indirectly from population pressures on limited fluctuating seasonal resources.

No artifacts recovered can be linked directly to land mammal hunting, but the unilaterally multibarbed points that armed sea otter arrows (Drucker 1951: 32) may have also been used for land game and birds. Hunting with arrows is indicated by several small fragmentary points with many closely spaced unilateral barbs. Such points continue from the Middle Period until late in the Late Period, when they are replaced by points with few widely spaced barbs.

Personal Adornment and Ceremonialism. The pendants and whistles inferred to be linked with adornment and ceremonialism poorly reflect the varied items noted by the Cook expedition at the end of the Late Period. Perforated deer phalanges, perforated fur seal teeth and jinglers of seal teeth continue from the Middle Period. Split and ground teeth of the Family Otariidae, especially the Steller sea lion, occur through the Late Period. A notched postcanine of the Steller sea lion dates to the beginning of the Late Period. Fragments of bird bone shafts with flattened ends, perhaps the tips of drinking tubes, continue from the Middle Period through the Late Period. Valves of small composite whistles first appear early in the Late Period and continue into the Historic Period, when they were used in the Wolf ritual. No carved whalebone ceremonial clubs were found in Late Period deposits, but fine examples collected by the Cook expedition (Gunther 1972: 209-11, items 34-36, 42-44) strongly resemble clubs of the Middle Period; such ceremonial clubs are therefore inferred to have been present through the Late Period. The emphasis in adornment and ceremonialism artifacts on large sea mammals such as the northern fur seal and Steller sea lion parallels the improvements in harpoon technology. Together these suggest that world view became more maritime oriented during the Late Period.

Habitations. No Late Period house remains were recovered. Habitations during the Late Period were no doubt like those described by the Cook expedition and depicted by Webber.

The Historic Period (A.D. 1790-1966)

The Historic Period is represented by 660 classified indigenous artifacts from Zone IV deposits which appear to have formed since the first Spanish occupation in 1789. The culture of the historical period has been described at length (Moziño 1970; Jewitt 1807; Smith 1974; Drucker 1951), and the process of sociocultural change at Nootka Sound has been outlined (Folan 1969, 1972, 1976; Folan and Dewhirst 1970; Dewhirst 1978). Owing to limitations of space, the discussion here must be confined to the indigenous artifacts recovered from the excavation. They indicate the continuation of indigenous cultural patterns during a time of profound sociocultural change. The indigenous artifacts also poorly reflect the largely perishable material culture reported for the end of the Late Period and the Historic Period (Drucker 1951; Moziño 1970; Bandi 1958; Henking 1957; Giglioli 1895; Read 1891; Force and Force 1968; Gunther 1972). Also excluded from discussion here are the numerous industrially made artifacts traded into Yuquot, left by the Spaniards or adopted by the Nootkans: metal artifacts (Lueger 1973), ceramics (Lueger 1976; Weigand et al. 1973), glassware (Jones 1970), beads (Karklins 1970-71) and tobacco pipes (Walker 1973). The types of historical artifacts and their dates of manufacture indicate that despite European contact with Nootkans for some years, Nootkan basic cultural patterns did not change extensively until late in the 19th century as a result of commercial expansion on coastal British Columbia and missionization of the native peoples. Until then, the Nootkans lived much as they had before, but adopted selected trade goods and commercial pursuits in fishing and sealing.

Manufacturing. Manufacturing technology and tools continue essentially the same from the Late Period. The following tools are present: abraders of all materials and classes; abrasive saws; broad celts; flat-polled narrow celts; shell celts; bone celts or gouges; beaver incisor cutting tools; antler sleeve hafts; broad, flat thin wedges; hand mauls; cobble hammers; cobble planes; grooved awls; wedge-tipped awls; broad-pointed awls; fine-pointed awls; dogfish dorsal spine artifacts; piercing needles; bark beaters; and bark shredders (inferred). Although the awls continue into the Historic Period, few specimens were recovered from the Zone IV deposits in contrast to lower strata. The awls may have been replaced early with hafted nails which are used today in basketry work. The absence of shuttles, if not due to our sampling, may reflect a decline in the weaving of cedarbark garments, which were replaced by trade blankets in the mid-19th century.

Present among the manufacturing tools, but not collected in our sample, are abundant iron cutting tools and true drills. The iron blades appear to have altered manufacture of at least the small bone and antler artifacts, so that they exhibit more whittled than ground facets. Long, fine parallel-sided perforations found on Historic Period beads indicate the use of a true drill, instead of the awls that must have been used prehistorically to make the biconical perforations.

Fishing. Fishing of salmon and nearshore pelagic and bottom species continues to be the primary subsistence orientation. The Late Period artifacts for fishing with hooks and lines continue into the Historic Period, except for the curved stem bone shanks. This discontinuity, however, may be due to our sample size, as wooden curved-stem shanks are known to have been used in the late 18th century. Salmon fishing with harpoons is well represented by the channelled valves armed with biconical points. A single-piece toggle head based on antler tine (Fig. 191) is present and probably occurs prehistorically as well. Wedge-based arming points are negligible. Short, stout, unbarbed points may have armed harpoon-leisters. Gorges used for small nearshore pelagic and benthic fishes continued to be used within the life spans of some now elderly respondents. The following styles of gorges are present: large, scalene, indented, double-indented rectangular, notched round, notched flat, plain round, plain flat, curved, tiny, and whole bird bone.

Hunting. Hunting is poorly reflected in the artifacts recovered. Slotted valves of composite female harpoon heads continue and were used in sealing until the early 20th century. Whaling appears to have declined in the late 19th century. Land hunting is suggested by the arrow points with widely spaced barbs, known to have been used for sea otter, but perhaps used for land mammals and birds as well. Large quantities of land mammal bones indicate that deer was the primary land mammal taken, likely by means of deadfalls, as is known ethnographically.

Personal Adornment and Ceremonialism. The few artifacts recovered poorly reflect the known adornment and ceremonialism. Only the valves of small composite whistles and whalebone war clubs (inferred), which continue from the Late Period, are known ethnographically. Other artifacts that continue from the Late Period are perforated deer phalanges, perforated northern fur seal teeth and tooth jinglers. Some artifacts appear limited to the Historic Period: perforated eagle phalanx, spruce gum beads, tubular stone beads of tuffaceous siltstone, carved figures of seal and bird and Thunderbird silhouette. Future excavations may show that some of the above objects originate in the Late Period.

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